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ARMY MENTAL TESTS

COMPILED AND EDITED
BY
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AND
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PUBLISHED WITH THE AUTHORIZATION
OF THE WAR DEPARTMENT

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PREFACE

During the past few months the Office of the Surgeon General of the Army and the National Research Council have been besieged with requests for information concerning the methods of psychological examining and for the printed materials used in the United States Army. To meet this demand it has seemed advisable to prepare this little book, which, in addition to the "Examiner's Guide," presents information concerning the results of psychological examining in the Army and indications of the possible uses of similar methods in education and industry.

The book has been prepared under the editorial direction of Majors Clarence S. Yoakum and Robert M. Yerkes, who, in coöperation with other members of the psychological staff of the Surgeon General's Office, selected the various materials and decided about the mode of presentation. The editors are responsible for the material of certain of the chapters, and they have indicated the responsibility of others wherever possible.

It has been arranged that the royalty from *Army Mental Tests* shall be paid to the treasurer of the National Research Council for the support of psychological research.

The instructions originally printed in the "Examiner's Guide" for the Stanford-Binet scale and the Point Scale have been omitted from this volume because of copyright restrictions, but these materials are available in books previously published.

A detailed and complete account of the methods and results of psychological examining in the Army is in course of publication in the Memoirs of the National Academy of Sciences, Washington.

THE EDITORS.

CONTENTS

PAGE

PREFACE iii
INTRODUCTION vii

CHAPTER I

MAKING THE TESTS 1

CHAPTER II

METHODS AND RESULTS 12

CHAPTER III

THE EXAMINER'S GUIDE FOR PSYCHOLOGICAL EXAMINING IN THE ARMY—DIRECTIONS FOR GIVING THE ARMY MENTAL TESTS 41

CHAPTER IV

ARMY TESTS IN THE STUDENTS' ARMY TRAINING CORPS AND COLLEGES 153

CHAPTER V

PRACTICAL APPLICATIONS 184

CHAPTER VI

ARMY TEST RECORD BLANKS AND FORMS 205

PREFACE
INTRODUCTION
MEASUREMENT OF MENTAL TRAITS
METHODS AND RESULTS
THE EXAMINER'S GUIDE
ARMY—DIRECTIONS FOR
ARMY TESTS IN THE SCHOOLS AND COLLEGES
PRACTICAL APPLICATIONS
ARMY TEST RECORD BLANKS AND FORMS

INTRODUCTION *

The human factors in most practical situations have been neglected largely because of our consciousness of ignorance and our inability to control them. Whereas engineers deal constantly with physical problems of quality, capacity, stress and strain, they have tended to think of problems of human conduct and experience either as unsolved or as insoluble. At the same time there has existed a growing consciousness of the practical significance of these human factors and of the importance of such systematic research as shall extend our knowledge of them and increase our directive power.

The great war from which we are now emerging into a civilization in many respects new has already worked marvelous changes in our points of view, our expectations and practical demands. Relatively early in this supreme struggle, it became clear to certain individuals that the proper utilization of man power, and more particularly of mind or brain power, would assure ultimate victory. The war demanded of us the speedy mobilization of our military machine and in addition the organization and training of an immense supplementary armed force, the manufacture of ordnance and munitions of war in well-nigh unimaginable quantities, the construction of ships, motor transports, and of varieties of rolling stock in vast numbers. All this had to be done in the least possible time. Never before in the history of civilization was brain, as contrasted with brawn, so important; never before, the proper placement and utilization of brain power so essential to success.

* Reprinted, in part, from a Harvey lecture delivered by Major Robert M. Yerkes in New York, January 25, 1919, and published with the approval of the Surgeon General of the Army, from the Section of Psychology of the Medical Department.

Our War Department, nerved to exceptional risks by the stern necessity for early victory, saw and immediately seized its opportunity to develop various new lines of personnel work. Among these is numbered the psychological service. Great will be our good fortune if the lesson in human engineering which the war has taught is carried over directly and effectively into our civil institutions and activities.

Scarcely had war been declared by our country before the psychologists were brought together in a plan to make their professional knowledge, technique, and experience useful in the emergency. In April, 1917, the American Psychological Association appointed numerous committees to study the situation and prepare for action. At the same time a Committee for Psychology was organized by the National Research Council. Thus it happened that from the outset American psychologists acted unitedly, whereas their professional colleagues in France and Great Britain served individually wherever they could discover opportunity. The Committee for Psychology of the National Research Council has continued active over a period of nearly two years. Almost all of the psychological contributions which the United States has made to the war are either directly or indirectly due to the efforts or the support of this body, the work of which has been carried on through conferences, sub-committees, or military appointees in the army and the navy.

In order that the psychological examining of the soldier may be seen in its proper setting, the various chiefly significant lines of psychological service will be enumerated and briefly characterized.*

Under the Adjutant General, the Committee on Classification of Personnel in the Army, which was originally organized by a

* An account of the kinds of psychological assistance given to various branches of the service will be found in the "Report of the Psychology Committee of the National Research Council," *Psychological Review*, March, 1919, vol. 26, pp. 83–149. Reprinted as No. 2 of *Reprint and Circular Series of the National Research Council.*

group of psychologists who were at the time serving as members of the Committee for Psychology of the National Research Council or of committees of the American Psychological Association for the furtherance of the military service, developed and introduced throughout the army methods of classifying and assigning enlisted men in accordance with occupational and educational qualifications and also methods of rating officers for appointment and promotion. The services of this Committee, to the work of which the War Department dedicated nearly a million dollars, ultimately touched and more or less profoundly modified almost every important aspect of military personnel.

To the Signal Corps, and subsequently to the Division of Military Aëronautics, psychological service was rendered in connection with measurement of the effects of high altitude and also in the selection and placement of men. Numerous important methods new or adapted, were introduced in this service by groups of psychologists whose primary concern was improved placement and the proper utilization and protection of the flyer.

The Committee for Psychology promoted effectively interest in measures for the control and improvement of both military and civilian morale. The interest and persistent activity of its members ultimately resulted in the organization of a Morale Branch within the General Staff of the Army. At various times as many as twenty-five officers and enlisted men trained in military psychology were engaged in the conduct of practical morale work.

For the Division of Military Intelligence psychological methods were devised or adapted to assist in the selection, placement and effective training of scouts and observers and in addition service of minor importance was rendered in numerous training camps.

In response to requests from the Chemical Warfare Service, psychological problems presented by the gas mask were studied

and the major recommendations resulting from these investigations were embodied in the latest improved form of mask.

The psychological problems either partially or completely solved for the navy are comprehended in the proper selection, placement and training of gunners, listeners and lookouts. Numerous situations were carefully analyzed for the navy, and methods and mechanical devices which have achieved extensive application and appreciation were developed.

Within the Medical Department of the Army a Division of Psychology was organized for the administration of mental tests to enlisted men and commissioned officers in accordance with plans perfected during the summer of 1917. The history of this work will be briefly told as an introduction to the account of methods and results.

The chief purpose of the psychological assistance originally offered to the Medical Department was the prompt elimination of recruits whose grade of intelligence is too low for satisfactory service. It was believed by psychologists assembled in conference that their profession is better prepared technically and by practical experience to measure intelligence than are members of the medical profession and that psychologists therefore should be able in the military emergency to render invaluable assistance to medical officers by supplying reliable measures of intelligence which might be used as partial basis for rejection or discharge. Thus, it was thought, the efficiency of the service might be considerably increased and the costs materially diminished. As it happens, the purposes of this service as actually developed differ radically from that originally proposed; moreover they serve to identify this work even more closely with the personnel work of the Adjutant General's Office and of the General Staff than with anything in the Medical Department of the Army aside from neuro-psychiatric work.

To meet the prospective need of psychological assistance a committee of seven experts in practical mental measurement was organized in the summer of 1917 and called together for

the preparation or selection of suitable methods. This group of men worked almost continuously for a month, devising, selecting and adapting methods. Another month was spent in thoroughly testing the methods in military stations in order that their value might be definitely established before they should be recommended to the Medical Department of the Army. The results were gratifying and the methods were therefore recommended to the Surgeon General of the Army in August, 1917, and promptly accepted for official trial. During October and November they were applied in four cantonments under conditions which could scarcely have been more unfavorable but with results which led the official medical inspector to formulate the following statements and recommendations:

"The purposes of psychological testing are (a) to aid in segregating the mentally incompetent, (b) to classify men according to their mental capacity, (c) to assist in selecting competent men for responsible positions.

"In the opinion of this office these reports (accompanying recommendation) indicate very definitely that the desired results have been achieved.

"The success of this work in a large series of observations, some five thousand officers and eighty thousand men, makes it reasonably certain that similar results may be expected if the system be extended to include the entire enlisted and drafted personnel and all newly appointed officers.

"In view of these considerations I recommend that all company officers, all candidates for [redacted] training camps and all drafted and enlisted men be re[redacted]o take the prescribed psychological tests."

In January, 1918, this new work of the Medical Department was extended in accordance with the above recommendation.

Placing psychological examining in the Medical Department naturally caused certain difficulties of administration. The confusion of psychological work with neuropsychiatry was one

of the first difficulties met. The administration of psychological examining by a medical officer increased the work of this officer and at the same time added to his staff a group of psychologists with whose work he was unfamiliar and who were perhaps more interested in establishing their particular examinations than in correlating their work with the work of the Medical Department. Notwithstanding these and many other difficulties which the new methods met, official inquiry into the results of the examining made in the latter part of November and the early part of December, 1917, indicated that seventy-five per cent of the officers who had become even slightly acquainted with the work favored the continuation of psychological examining.

The original purposes of the committee in the preparation of methods for intelligence testing were less important than the uses actually made of the results. It was the intention of the committee as stated above to prepare an examination that would indicate the drafted men who were too low-grade mentally to make satisfactory privates in the Army; it was desired also to indicate, if possible, those who were mentally unstable or who might prove incorrigible so far as army discipline was concerned. In addition, the committee hoped to be able to pick out exceptional types of men who could be used for special tasks that demanded a high degree of intelligence. In interesting contrast with these original purposes of mental examining stand the results actually achieved.

1. The assignment of an intelligence rating to every soldier on the basis of systemat[redacted]ination.

2. The designation a[redacted]ion of men whose superior intelligence indicates the [redacted]ability of advancement or special assignment.

3. The prompt selection and recommendation for development battalions of men who are so inferior intellectually as to be unsuited for regular military training.

4. The provision of measurements of mental ability which

enable assigning officers to build organizations of uniform mental strength or in accordance with definite specifications concerning intelligence requirements.

5. The selection of men for various types of military duty or for special assignment, as for example, to military training schools, colleges, or technical schools.

6. The provision of data for the formation of special training groups within the regiment or battery in order that each man may receive instruction suited to his ability to learn.

7. The early discovery and recommendation for elimination of men whose intelligence is so inferior that they cannot be used to advantage in any line of military service.

It is of course unfortunate from the point of view of scientific research that many lines of investigation indicated by these general results could not be carried out. The psychological service existed in the Army for strictly practical purposes. The directors of the service emphasized continually the necessity for rendering immediate assistance in the organization of the Army and the setting aside of all investigations which did not further this practical end. The results given in the following chapter are therefore based almost entirely on military needs and indicate the success of this service in the Army. The more strictly scientific aspects of this type of examining can be considered in future studies when the practical aim is less insistent or can more readily be made subservient to scientific standards.

ARMY MENTAL TESTS

CHAPTER I

MAKING THE TESTS

The origin of general intelligence tests is due to the genius of Alfred Binet. His investigations and early publications gave the stimulus to the development of mental tests for school children. He also did pioneer work in the study of the characteristics of the feeble-minded. Since his early work appeared in 1905, the volume of material has become extremely large. Numerous tests have been used in the schools and in psychological laboratories. Many of these have been standardized and have proved particularly useful in school and community surveys. Noteworthy advances have been made by psychologists in the United States. Three of the most important steps in individual testing are represented by the Goddard revision of the Binet Scale, the Yerkes-Bridges Point Scale and the Stanford revision of the Binet Scale. Whipple's "Manual of Mental and Physical Tests" conveniently presents the literature of tests and standards for many of them.

Group methods of mental testing were foreshadowed by a few studies previous to the development of the army methods. These were scattering and had had no extensive use before 1917. The idea of examining children and others in groups, however, existed and it was on the basis of these preliminary studies and the work in individual examining that the committee which met at Vineland felt that it could produce a group examination which would serviceably classify recruits for army purposes. Three or four of the members of this committee had had direct experience with group methods.

The committee consisted of R. M. Yerkes, Chairman; W. V. Bingham, Secretary; H. H. Goddard, T. H. Haines, L. M. Terman, G. M. Whipple, and F. L. Wells. Each of these men brought to the work of the committee a large amount of material which was sifted to produce the group test and individual examining materials of the first "Examiner's Guide." Hundreds of tests already published were also available. The committee drew upon these published tests and upon the materials brought together by the members for the group methods and for the individual methods devised for the Army. A complete group test, the work of A. S. Otis of Leland Stanford University, quite similar in form to that finally adopted by the Army was in manuscript. It also was drawn upon in making the army tests.

It is not the purpose of this chapter to go into detail concerning the work of the committee in the preparation of the army mental tests. But it does seem worth-while to call attention to certain principles that underlie the making of general intelligence tests and to suggest certain cautions in their use. The ease with which the army group test can be given and scored makes it a dangerous method in the hands of the inexpert. It was not prepared for civilian use, and is applicable only within certain limits to other uses than that for which it was prepared. In order to indicate this limited applicability, we shall quote here the criteria formulated and accepted by the committee before any work on the tests was attempted.

The test to be devised for army use the committee believed should, first, be adaptable for group use for the examining of large numbers rapidly. Second, it should have a high degree of validity as a measure of intelligence. Third, the range of intelligence measured by the tests should be wide; that is, the test should be made difficult enough to measure the higher levels of intelligence and at the same time be an adequate measure of the extremely low levels that would probably be found in the Army. Fourth, as far as possible, it should be arranged for

objectivity of scoring and the elimination of personal judgment concerning correct answers; thus the results of scoring in one camp would be strictly comparable with those obtained in another. Fifth, the test should be so arranged that the scoring could be done rapidly and with the least chance of error. Also, this arrangement should be so simple that relatively inexpert assistance could be used in scoring the large numbers of papers. Sixth, there must be either different forms or alternative tests of equal difficulty to prevent coaching. Seventh, it was necessary also to obtain clues which would enable examiners to detect malingering in connection with the examination. Eighth, cheating must also be avoided. Ninth, the test must be made as completely independent of schooling and educational advantages as possible. Tenth, the arrangement should be such as to allow a minimum of writing in recording answers. Eleventh, the tests must consist of material which would arouse interest in the subjects. Twelfth, the different tests used should be arranged to yield an accurate measure of intelligence in a reasonably short time.

With these criteria in mind the committee set to work on the materials available to produce what is now known as the army mental test. In the original series there were thirteen different tests. These were rated by the psychologists present on the basis of their validity as measures of intelligence. All other criteria mentioned were also taken into account. These tests were then given to selected groups and the results compared with the criteria laid down. As a result certain tests were eliminated because they failed to meet the requirements.

In connection with each of the tests finally selected, certain additional cautions are to be noted. In general, the battery of tests selected was composed of separate tests no one of which exceeded a time limit of approximately five minutes. The number of items in each test and the time limits were so fixed that five per cent or less in any average group would be able to finish the entire series of items in the time allowed. It was deemed

advisable to have the directions for each test read aloud by the examiner and to have the subjects follow the reading of the directions. For each test a series of sample items correctly answered was given. In order to prevent coaching and cheating, alternative forms were prepared. Materials were gathered by the committee for ten of these alternative forms, but only five were finally printed. In making the alternative forms of the tests, approximately equal difficulty for the forms was desired. This was obtained by using the principle of random selection in preparing the items for each test. For example, if a test had forty items, and ten forms were to be made, four hundred items of the nature desired in the test were prepared. These were printed on separate slips of paper and shuffled. From this mass of four hundred items were drawn the items for each form alternately.

The methods of scoring necessary for speed and accuracy were determined empirically after the first and second trials of the tests. Special methods of selecting the material for the items in each of the tests were used and specific cautions were observed in the arrangement of the items in each. These need not be discussed here. As an example, however, of the care with which the tests were made, we may cite the procedure used in test seven, known as the analogies test. Here two words with a specific relation are given together with a third word which bears that same relation to another word in a group of four words. This word in the group of four bears, as has been stated, the relation to the third word that holds for the first two. However, another word in this group of four words bears a relationship to the third word commonly known as the "free association relationship." That is to say, if the third word is spoken to a listener who is asked to give the first word that occurs to him after hearing this word the chances are high that he will give this second word as the "free association" word. The peculiar nature and difficulty of the test at once becomes apparent when this method of making it is known.

In test five (the disarranged sentence test), as in certain of the other tests, the chance order of true and false sentences was used. In other words, an equal number of true and false items was selected for any one form of this test. The sequence in which they appeared on the page was determined by tossing a coin. In addition to these special principles in making up the tests, the items were arranged as far as possible in the order of difficulty, the easier ones being placed first and the more difficult ones last.

As stated above, the preliminary trials gave the basis for the revision and modification of the tests originally selected. After this revision and modification, ten tests remained. These ten tests were then given to approximately five thousand men in the Regular Army and National Guard, and in addition, to a variety of subjects outside of the Army. This range of subjects included inmates of institutions for the feeble-minded, members of officers' training schools, and students in colleges and universities.

The examination papers, just as the examinees had marked them, were sent to Columbia University, where a statistical group headed by Edward L. Thorndike studied the results of the tests to check their validity, reliability and significance. The technical methods used cannot be described here. Some of the more simple methods and checks, however, may be mentioned. A brief enumeration of these will indicate the laborious nature of the task of standardizing a test. Certainly the usefulness of a test requires clear formulation and close study of the problem, painstaking "fitting" of the test to the conditions set, correct and proper statistical studies of results and, first and last, skill and originality in devising the form and content of the test itself.

At the same time that these statistical investigations were being carried on, the tests were given to other subjects who had previously been examined by established methods of mental testing. Other measures of intelligence, such as officers' ratings

of soldiers of the National Guard and the Regular Army, were obtained. Where school children or college students were examined, teacher's estimates of intelligence and college or school grades were used. The results of the army intelligence tests were then compared with these other measures of intelligence.

In a group of tests, such as the army group examinations, each of which is made up of eight types of test, it is necessary to note the relations between the separate tests. If, for example, the relationship between two of the tests is very high, it is possible that the tests are repetitive and that one of them is unnecessary. On the other hand, an extremely low relationship between one of the tests and the total score might indicate that the test should be omitted because it adds little to the measure of intelligence yielded by the group of tests as a whole. The caution to be observed in this instance, or where a specific testing purpose is in view, is that the test may measure some ability of equal importance with the abilities measured by the other tests of the group. The relation of the group of tests to the independent measure of the trait in question constitutes the specific reason for keeping or rejecting a test which shows low relationship to the total score.

Other things to be noted in measuring the usefulness of a particular test are the number of zero scores produced by the test, the time allowance, and the method of scoring. It is obvious, for example, that if fifty per cent of the group tested, or even twenty per cent, make zero scores, the test is unsatisfactory as a measure of a wide range of intelligence. It is also important to note whether most of the persons tested are given opportunity to exhibit their maximum ability in a test; too short a time allowance may prevent some from reaching items of sufficient difficulty to test their ability. On the other hand, in preparing the army tests it was necessary to limit the time allowance in accordance with the practical situation.

In scoring the tests certain mathematical precautions are necessary. For instance, the test which offers only two alterna-

tives will yield a high percentage of right scores by chance. To compensate for this, such a test may be scored "right minus wrong." In addition, a considerable list of observations necessary in finally checking the validity of the army tests might be given.

It was found that on the whole the ten tests which constituted the examination known as Examination A, forms A, B, C, D, and E of the official army trial in the fall of 1917, were fairly satisfactory measures of intelligence. The score distributions for each of the tests were good; that is, there were relatively few zero scores and a small percentage of the subjects could either finish or practically finish the tests in the time allowed. A study of the increase in incorrect answers in the upper range of items in each test also indicated that the tests approximated a measure of actual ability and were not merely testing speed in reading or thinking. There proved to be a regular gradation of score distributions from the graduate students through the officers' training school men, regular and national guard privates, down to the inmates of institutions for the feeble-minded. Comparison of the results of the tests with officers' ratings of their own men showed a satisfactory degree of correspondence. On the whole, the tests graded the men as the officers estimated the value of these same men to the army. Repetition of the tests indicated that they had a fairly high degree of reliability. If a man did his best, the chances were that he would vary ten points or less on a second trial. The statistical results indicated further that for the entire group it was fairly safe to say that the men's true scores were not more than fifteen points above or below the ones actually recorded. In this connection, it may be noted that the alpha examination, which is the one given in the Examiner's Guide included in this volume, shows an even higher reliability. The evidence indicates that the average scores due to accidental circumstances vary, for this examination, not more than five points up or down.

Comparisons of the results of the tests with schooling as re-

ported by the person tested indicate that the tests are not merely a measure of schooling or of opportunity to attend school but are actually a measure of native ability. All five forms of the group examination were used in the pre-official trial of the tests. The differences in forms were so slight as to indicate the success of the random method of selecting items. Form B proved more difficult than the other forms. The order of items was changed, as a result of the trial, in a few instances.

One further question remained. How should the results of widely distributed testing of this sort be interpreted? In this connection it may be emphasized again that the group examination used in the Army was interpreted entirely in terms of military needs. Modifications made in the tests, such as scoring and weighting, were all intended to make it a better measure of ability in the Army. This specialization of the group examinations for the Army makes them less valuable in other fields.

We have indicated above that the range of intelligence measured by the tests included distinctly feeble-minded persons as well as officers and graduate students. The assignment of letter grades to the score distributions was based upon this range. The scores were designated as A, B, C, D, and E ratings. This division into five grades or ratings was considered sufficiently fine for the principal army uses. Subdivisions can be introduced to any extent desired. The alpha numerical score ranges from 0 to 212 points. In preparing distribution tables, scatter tables, and in all statistical calculations 5 and 10 point groups or classes are used. For example, all scores of 55 to 59 points (or 70 to 79 points) inclusive form one group.

Officers' training school candidates and graduate students made as a rule A and B scores. Clerical assistants and men in the Regular Army who could handle the paper work usually made grades in upper C or B. The average private scored C. Men who reported themselves as laborers fell in grade D and privates who belonged to service organizations or who were

relatively ineffective in the Army or men who were inmates of institutions for the feeble-minded made scores in low D or E.

The general intelligence test for literates, covering a wide range of ability, was prepared for its official trial in the manner described above. The need for haste in its construction made it important that a thorough study of the test in actual camp conditions be undertaken. This trial was made in four national army cantonments in the fall of 1917. Approximately 80,000 men were tested in this official trial of the methods. About 7,000 college, high school and elementary school students were also tested in order to check the army results. All of the data available from the official trial were then subjected to statistical treatment as a basis for revision of the tests.

Psychologists from the camps and members of the original committee spent over two months in the study of results and in the revision of methods. From this work and the preliminary trials that followed the revision, the present methods were obtained. The group examination beta was prepared to enable examiners to make a rapid survey of the 30 per cent who either could not read English or read it so slowly that they could not do themselves justice in the test for literates. The Stanford-Binet and the Point Scale were adapted for army use at this time and the individual examination for foreigners and illiterates was prepared.

The validity of the tests as measures of intelligence was checked against every available criterion, including officer ratings of men, army rank as an outcome of survival of the fittest, other kinds of intelligence scales, professional success, and ability to learn as evidenced by school standing. Not only has the scale as a whole been thus checked up, but also every one of the separate parts making up the scale. The correlations with other criteria of known validity were almost invariably high. The influence of literacy, repetition of the test, physical condition of the examinee, and the personal equation of the examiner have all been carefully considered.

The development of the beta test and of the performance test for the examination of the foreign speaking and illiterate presented special problems. The use of demonstration charts and pantomime to convey the instructions to the persons being examined proved successful. The new type of test in the beta, using geometrical designs, mutilated pictures, etc., required different principles in its construction. The individual performance tests also involved additional and peculiar standards of construction and evaluation.

The important purpose of these supplementary tests was, of course, to give to those handicapped by language difficulties a real opportunity to show their ability. In addition, two definite aims were planned in the use of all forms of testing: first, to point out the feeble-minded and those incapable of military service because of mental deficiency and, second, to find those of unusual or special ability. The arrangement of each test, in both group and individual examinations, was therefore checked against the scores of men in institutions for the feeble-minded. If no score had meant low mentality the first task would have been solved; but we have shown that literacy was an important factor in the alpha test. The beta test practically eliminated this factor and was thus a step further in selecting those of low intelligence. To prove conclusively that a man was weak-minded and not merely indifferent or malingering, the performance test was added.

The individual examinations as finally used in the Army were, therefore, primarily checks on the group examinations. No person was reported as feeble-minded until a detailed individual psychological examination had been made. Many cases of mental disorder were discovered and referred to the psychiatrists for examination. Disciplinary cases referred to the psychologists were always given individual examinations, as were referred cases of men having difficulty with drill or those who failed to improve in the Y. M. C. A. schools and elsewhere.

A detailed statement of how these tests are made is impracti-

cable here. Most of the methods used in the army and given in the Examiner's Guide are described in journals and in the literature of mental tests. The results of their use are indicated by the numbers of examinations made and by the totals of low-grade cases found. The instructions for giving the tests are perhaps more essential in individual examination than they are in the group examinations. Again, the detailed cautions have been presented in the literature of mental tests and need not be repeated at this point.

CHAPTER II

METHODS AND RESULTS *

After preliminary trial in four cantonments psychological examining was extended by the War Department to the entire Army, excepting only field and general officers. To supply the requisite personnel a school for training in military psychology was established in the Medical Officers' Training Camp, Fort Oglethorpe, Georgia. Approximately one hundred officers and more than three hundred enlisted men received training at this special school.

On November 11, 1918, the psychological personnel consisted of about one hundred and twenty officers and three hundred and fifty enlisted men. Over five hundred additional clerks were used in the examining service in the thirty-five different camps in which psychological examining had been established. The army intelligence examination had been given to 1,726,966 men; of these 41,000 were officers. Approximately 83,000 individual examinations had been given. Over 7,800 men had been recommended for immediate discharge; 10,014 had been recommended for labor battalions or other service organizations; 9,487 had been recommended for development battalions for further observation and preliminary training. Nearly 30 per cent of the 1,556,011 men for whom statistics are available were found to be unable to "read and understand newspapers and write letters home," and were given a special examination prepared for illiterates.

The general classification of the men proceeded as rapidly as

* Reprinted, with modifications, from the Harvey lecture cited above and "Army Mental Tests." The latter was prepared by Major Lewis M. Terman and Dr. Mabel R. Fernald and printed by the National Research Council in 1918.

they reported to camp. Men qualified to be non-commissioned officers and candidate-officers on the basis of satisfactory intelligence scores were pointed out within forty-eight hours of their arrival. By this time the general usefulness of psychological examining was no longer seriously questioned, and it had become necessary for the psychologists of a camp to emphasize continually that the methods were intended as a measure of only one of the essential qualities of a soldier.

A few quotations from the statements of officers will indicate their general attitude, and typical ways in which the results were used in training men and in selecting candidates for the officers' training schools.

"Officers and men should be given a psychological examination as a matter of routine.

"The results of the psychological examinations are fully borne out by actual observation of the abilities and the capacity of various officers in the performance of duties assigned to them. I do not mean by this that these tests are an absolute gauge, but I do mean that they are an absolute guide, and that given the practical tests we are enabled to arrive at the best possible determination of ability to meet the requirements of the service.

". . . This subject of psychology in its relation to military efficiency is an entirely new one, and the War College Division approached it with a good deal of doubt as to its value. A very thorough study of the reports submitted, however, has firmly convinced it that this examination will be of great value in determining the possibilities of newly drafted men and all candidates for officers' training camps.

". . . At first, due to the innate conservatism of line and even of medical officers, his (the psychological examiner's) task was a rather uphill one, but now, due to his own energy and tact and to the thoroughness and honesty of his work, practically all officers have been convinced of its practical value and unique assistance in rating, sorting and disposing of the divers kinds of men *as well as officers* who pass through such a camp. . . . I consider such an expert and his specialty among the most useful aids in the scientific and non-wasteful utilization of man power.

". . . I consider the Psychological Service of especial value in this camp, which is devoted to the elementary training of recruits for field artillery. . . .

"The forms (filled out by applicants) were arranged in the order of the psychological mark, and all applicants of Class A were gone over with a view of finding out if there were any who, because of a specific statement of the company commander, should be thrown out without further examination. There were almost none of these. The same thing was done with all of Class B. The Class C applicants were then gone over with a view of seeing if there were any who, notwithstanding their low psychological mark, should nevertheless be considered because of the specific statement of the company commander. There were very few of these.

"The psychological examination of these men . . . has been a great aid to me as commanding officer of the school, not only in the final summing up of their qualifications for an officer's commission, but also during their stay at the school in working out the reasons for their apparent deficiency. . . . It is recommended that in the future all candidates for Officers' Training School be sent first before a psychological board, and that the results of this examination be a determining factor in their entrance to the school."

"I consider it highly desirable to use psychological ratings in the selection of all applicants for the Officers' Training Camp. . . . It is doubtful whether applicants should be admitted to the school who have not, according to the psychological examinations, made a score equivalent to "high average" intelligence (C+). . . . Intelligence rating should receive primary consideration, and all other important factors secondary consideration. In very exceptional and rare cases it is possible that this order of consideration may be reversed. . . . We find the psychological ratings more reliable than any other information. Above all else, an officer should have a high degree of intelligence, and when this is combined with an excellent physical record, leadership, etc., we have the type desired for a commissioned officer."

"The Board of Officers, charged with the duties of examining candidates for the Officers' Training School regard the psychological ratings as the one best factor of the various factors which determine a candidate's qualification for entry to said school.

"Concurring in the opinion of the Commanding Officer of the Training School, this camp, the above board of officers hold that all candidates should have not less than a high average intelligence rating (C+) to qualify for entry to training schools, except in rare and exceptional cases in which other factors are extremely favorable. It is the unanimous opinion of this Board that the intelligence rating is the most reliable index, in that a quantitative statement is available and in that

rough observation is effectively checked. The psychological rating is, therefore, considered of primary importance.

". . . From my experience in different camps, I am of the opinion that enlisted men who rate below the A and B classes (by the psychological test) should not be considered as candidates for the Officers' Training Schools.

"All enlisted men sent to Officers' Training Schools from this camp are inspected as to their military appearance and bearing, and their knowledge of the elementary duties of a soldier; they are given a physical examination, a mental examination, and the psychological examination. If they do not rate A or B in this examination they are rejected."

The methods originally prepared for use in the Army were subjected to repeated revisions, in the light of results, for increase in reliability and military value. The procedure finally adopted and used throughout the Army consists of two chief types of examination: the group examination and the individual examination. The former was necessitated by the demand for speed of examination and report, the latter by the desire for reliability and fairness to the individual.

Of group examinations, there are two varieties used in the Army; the one for men who can read and write English fairly well (literates), known as alpha; the other for men who are unable to read and write English well (illiterates), known as beta. The individual examination includes three varieties developed, as were the group examinations, to suit different types of subjects. They are: (1) the Point Scale examination, (2) the Stanford-Binet examination, and (3) the Performance Scale examination. Both the Point Scale and the Stanford-Binet are used in the Army in three forms: (a) as complete scales, for literate subjects, (b) as abbreviated scales, for literate subjects, (c) as specially adapted scales, for relatively illiterate subjects. These two types of examination, the Point Scale and Stanford-Binet, are used as alternates, the examiner selecting in accordance with his preference.

For the examination of foreign and illiterate men who can

neither read nor write English and of whom many speak and understand it very imperfectly, the special form of examination known as the performance scale, has been developed and is effectively used.

Examination alpha consists of eight tests, describable by title as follows: test 1, directions or commands test; test 2, arithmetical problems; test 3, practical judgment; test 4, synonym-antonym; test 5, disarranged sentences; test 6, number series completion; test 7, analogies; test 8, general information.

With this method men are examined in groups as large as five hundred. Every man is supplied with a pencil and an examination blank. He then, under military discipline, follows directions to the best of his ability. The examination requires approximately fifty minutes. It demands almost no writing since responses are indicated by underscoring, crossing out, or checking. The examination papers are quickly scored by means of stencils, and mental ratings recorded for prompt report. To avoid, within reasonable limits, the risk of coaching, several duplicate forms of this examination have been made available.

Each test of examination alpha consists of a number of parts arranged in order of difficulty from low to high. It is therefore possible for low-grade subjects to make a start on each test, and, at the same time, practically impossible for highly intelligent subjects to complete the tests within the time allowed. The tests are varied in character and undoubtedly sample the most important types of intellectual process.

Examination beta consists of seven tests, listed thus by title: test 1, maze test; test 2, cube analysis; test 3, X-O series; test 4, digit-symbol; test 5, number checking; test 6, pictorial completion; test 7, geometrical construction.

This examination, which was devised after alpha had been put into use to meet an unexpected demand for the examination of subjects of low literacy and extreme unfamiliarity with English, is in effect, although not in strictness test for test, alpha translated into pictorial form so that pantomime and demon-

stration may be substituted for written and oral directions Beta may be given successfully to men who neither speak nor understand English.

Examinations alpha and beta are so constructed and administered as to minimize the handicap of men who because of foreign birth or lack of education are little skilled in the use of English. These group examinations were originally intended, and are now definitely known, to measure native intellectual ability. They are to some extent influenced by educational acquirement, but in the main the soldier's inborn intelligence and not the accidents of environment determines his mental rating or grade in the army.

Like alpha, examination beta requires about fifty minutes and the papers are scored by the use of stencils.

Both alpha and beta yield numerical scores or intelligence scores which for practical military purposes are translated into letter grades. The several letter grades used in the Army, with their score-equivalents and appropriate definitions are presented in the following table.

Intelligence grade	*Definition*	*Score (alpha)*	*Score (beta)*
A	Very superior	135–212	100–118
B	Superior	105–134	90–99
C+	High average	75–104	80–89
C	Average	45–74	65–79
C−	Low average	25–44	45–64
D	Inferior	15–24	20–44
D−	Very inferior	0–14	0–19

E grade was reserved for men who were recommended for rejection, discharge, development battalion, or service organization. All men deemed satisfactory for regular military duty were graded D − or higher.

Neither the Point Scale * nor the Stanford-Binet Scale †

* See "Point Scale for Measuring Mental Ability," by Yerkes, Bridges, and Hardwick. Warwick & York, Baltimore.

† See "The Measurement of Intelligence," by L. M. Terman. Houghton Mifflin Company, Boston.

need be described in detail, since both are widely known and adequate descriptions are available. The military adaptations of the scales may prove useful in various civil situations, but because of copyright restrictions they are not reproduced in this volume.

The several procedures of individual examining have played a most important rôle in the military service, and the examiner who lacks familiarity with them and reasonable skill in their application and the interpretation of their results is ill-prepared for psychological military service.

The army performance scale cannot be adequately described by reference since it is in the main a product of military experience and effort. It consists of ten tests, the titles of which fairly well suggest their nature: test 1, the ship test; test 2, manikin and feature profile; test 3, cube imitation; test 4, cube construction; test 5, formboard; test 6, designs; test 7, digit-symbol; test 8, maze; test 9, picture arrangement; test 10, picture completion.

As in the case of group examinations alpha and beta, so also in that of the several forms of individual examination, numerical scores for subjects were secured which could be translated into letter grades.

The general procedure of examining which was developed to meet military requirements is briefly describable as follows: A group of draftees, the size of which is determined by the seating capacity of examining room (it varies from one hundred to five hundred men) is reported to the psychological examining building for mental test. The first essential step is the segregation of the illiterates. This is accomplished by having all men who cannot read and write their own letters and those who have not proceeded beyond the fifth grade in school step out of the original group. The remaining men are sent to the alpha room. Naturally, among them there are likely to be several who will subsequently have to take the beta examination. The illiterates are sent directly to the beta room.

Men who fail in alpha are sent to beta in order that injustice by reason of relative unfamiliarity with English may be avoided. Men who fail in beta are referred for individual examination by means of what may appear to be the most suitable and altogether appropriate procedure among the varied methods available. This reference for careful individual examination is yet another attempt to avoid injustice either by reason of linguistic handicap or accidents incident to group examining.

It is to be emphasized that the interests of the individual who is either in the army or in process of being accepted for military service are safeguarded by a system of three types of examination which serve as sieves. Every soldier is required to take at least one examination. Men who are of low mentality, those who are of foreign birth or for other reasons illiterate, and those who exhibit marked peculiarities of behavior may be required to take either two or three examinations before the psychological report can be completed.

Despite the necessity for haste which in some instances compelled small examining staffs to grade and report on as many as two thousand soldiers per day, the army mental test work has been done with an average thoroughness and degree of reliability which would do credit to any school system or other civil institution.

When psychological examining was originally accepted by the Medical Department for official trial, there was extreme and widely prevalent skepticism even among psychologists themselves concerning the reliability of the measurements of intelligence which could be secured and still more concerning their practical value to the Army. The measures of reliability or validity of army methods of mental measurement which have been obtained during the past eighteen months are therefore quite as important as a partial basis for safe opinion concerning the significance of this service as are the evidences of practical value which have accumulated. Effort will be made to present, as adequately as is possible within brief compass,

samples of both kinds of measure. First, reliability may be considered.

For examination alpha the probable error of the score is approximately 5 points. This is one-eighth of the standard deviation of the score distribution for unselected soldiers. The reliability coefficient is approximately .95. Alpha yields correlations with other measures of intelligence as follows: (1) with officers' ratings of their men .50 to .70; (2) with Stanford-Binet measurements, .80 to .90; (3) with Trabue B and C completion tests combined, .72; (4) with examination beta, .80; (5) with composite of alpha, beta and Stanford-Binet, .94; (6) in the case of school children alpha measurements correlate with (a) teachers' ratings .67 to .82, (b) school marks .50 to .60, (c) school grade location of thirteen and fourteen-year-old pupils .75 to .91, (d) age of pupils .83.*

Results for examination beta correlate with alpha, .80; with Stanford-Binet, .73; with composite of alpha, beta and Stanford-Binet, .91.

Results of repetition of the Stanford-Binet examination in case of school children correlate .94 to .97. The abbreviated form of the Stanford-Binet scale consisting of only two tests per year, extensively used in the army, correlates .92 with results for the entire scale.

Reliability coefficients for results of point scale examination closely approximate those for the Stanford-Binet scale.

The several tests of the performance scale, taken separately, correlate with Stanford-Binet measurements, .48 to .78. Five of the ten tests of the performance scale yield a total score which correlates .84 with Stanford-Binet results.

It is definitely established that examination alpha measures literate men very satisfactorily, considering the time required, for mental ages above eleven years. Examination beta is somewhat less accurate than alpha for the higher ranges of intelli-

* Chiefly because of the relatively narrow age range, the correlation of alpha score with age of recruits is practically zero.

gence. There are convincing evidences that some men are not fairly measured by either alpha or beta and that the provision of careful individual examination for men who fail in beta is therefore of extreme importance.

There follows a brief statistical summary of results of individual examining in the Army, and a discussion of military applications and evidences of practical value.

Between April 27 and November 30, 1918, 7,749 men (0.5 per cent) were reported for discharge by psychological examiners because of mental inferiority. The recommendations for assignment to labor battalions because of low-grade intelligence, number 9,871 (0.6+ per cent). For assignment to development battalions, in order that they might be more carefully observed and given preliminary training to discover, if possible, ways of using them in the Army, 9,432 men (0.6+ per cent) were recommended.

During this same six-month interval there were reported 4,744 men with mental age below seven years; 7,762, between seven and eight years; 14,566, between eight and nine years; 18,581, between nine and ten years. This gives a total of 45,653 men under ten years mental age. It is extremely improbable that many of these individuals were worth what it cost the government to maintain, equip and train them for military service.

The psychological rating of a man was reported promptly to the personnel adjutant and to the company commander. In addition, all low-grade cases and men exhibiting peculiarities of behavior were reported also to the medical officer. The mental rating was thus made available for use in connection with rejection or discharge, the assignment of men to organizations and their selection for special tasks. The mental ratings were used in various ways by commanding officers to increase the efficiency of training and to strengthen organizations by improved placement.

It was repeatedly stated and emphasized by psychological

examiners that a man's value to the service should not be judged by his intelligence alone, but that instead temperamental characteristics, reliability, ability to lead and to "carry on" under varied conditions should be taken into account. Even after the feasibility of securing a fairly reliable measure of every soldier's intelligence or mental alertness had been demonstrated, it remained uncertain whether these measurements would correlate positively with military value to a sufficient degree to render them useful. Data which have become available during the past year settle this question definitely by indicating a relatively high correlation between officers' judgments of military value and the intelligence rating.

A description and explanation of the letter ratings used by psychological examiners were handed to each officer who received the scores of recruits. Directions for the use of the ratings were also supplied. Quotations from "Army Mental Tests" will indicate the nature of these explanations and directions.

In explanation of letter ratings:—The rating a man earns furnishes a fairly reliable index of his ability to learn, to think quickly and accurately, to analyze a situation, to maintain a state of mental alertness, and to comprehend and follow instructions. The score is little influenced by schooling. Some of the highest records have been made by men who had not completed the eighth grade. The meaning of the letter ratings is as follows.

A = Very superior intelligence. This grade is ordinarily earned by only four or five per cent of a draft quota. The "A" group is composed of men of marked intellectuality. "A" men are of high officer type when they are also endowed with leadership and other necessary qualities.

B = Superior intelligence. "B" intelligence is superior, but less exceptional than that represented by "A." The rating "B" is obtained by eight to ten soldiers out of a hundred. The group contains many men of the commissioned officer type and a large amount of non-commissioned officer material.

C + = High average intelligence. This group includes fifteen to eighteen per cent of all soldiers and contains a large amount of non-commissioned officer material with occasionally a man whose leadership and power to command fit him for commissioned rank.

C = Average intelligence. It includes about twenty-five per cent of soldiers. Excellent private type with a certain amount of fair non-commissioned officer material.

C − = Low average intelligence. This group includes about twenty per cent. Although below average in intelligence, "C−" men are usually good privates and satisfactory in work of a routine nature.

D = Inferior intelligence. It includes about fifteen per cent of soldiers. "D" men are likely to be fair soldiers, but they are usually slow in learning and rarely go above the rank of private. They are short on initiative and so require more than the usual amount of supervision. Many of them are illiterate or foreign.

D− and E = Very inferior intelligence. This group is divided into two classes (1) "D−" men, who are very inferior in intelligence but are considered fit for regular service; and (2) "E" men, those whose mental inferiority justifies their recommendation for development battalion, special service organization, rejection, or discharge. The majority of "D−" and "E" men are below ten years in "mental age."

The immense contrast between "A" and "D−" intelligence is shown by the fact that men of "A" intelligence have the ability to make a superior record in college or university, while "D−" men are of such inferior mentality that they are rarely able to go beyond the third or fourth grade of the elementary school, however long they attend. In fact, many "D−" and "E" men are of the moron grade of feeble-mindedness. "B" intelligence is capable of making an average record in college, "C+" intelligence can not do so well, while mentality of the "C" grade is rarely capable of finishing a high school course.

Concerning directions for the use of intelligence ratings:—In using the intelligence ratings the following points should be borne in mind.

1. The mental tests are not intended to replace other methods of judging a man's value to the service. It would be a mistake to assume that they tell us infallibly what kind of soldier a man will make. They merely help to do this by measuring one important element in a soldier's equipment, namely, intelligence. They do not measure loyalty, bravery, power to command, or the emotional traits that make a man "carry on." However, in the long run these qualities are far more likely to be found in men of superior intelligence than in men who are intellectually inferior. Intelligence is perhaps the most important single factor in military efficiency, apart from physical fitness.

2. Commissioned officer material is found chiefly in the "A" and "B" groups, although of course not all high score men have the other qualifications necessary for officers. Men below "C+" should not be accepted as students in Officers' Training Schools unless they possess exceptional power of leadership and ability to command.

3. Since more than one-fourth of enlisted men rate as high as "C+," there is rarely justification for going below this grade in choosing non-commissioned officers. This is especially important in view of the likelihood of promotion from non-commissioned to commissioned rank. Even apart from considerations of promotion, it is desirable to avoid the appointment of mentally inferior men (below C) as non-commissioned officers. Several careful studies have shown that "C−" and "D" sergeants and corporals are extremely likely to be found unsatisfactory. The fact that a few make good does not justify the risk taken in their appointment.

4. Men below "C+" are rarely equal to complicated paper work.

5. In selecting men for tasks of special responsibility the preference should be given to those of highest intelligence rating

who also have the other necessary qualifications. If they make good they should be kept on the work or promoted; if they fail they should be replaced by men next on the list.

To aid in selecting men for occupational assignment, extensive data have been gathered on the range of intelligence scores found in various occupations. This material has been placed in the hands of Personnel Officers for use in making assignments. It is suggested that those men who have an intelligence rating above the average in an occupation should be the first to be assigned to meet the needs for that occupation. After that, men with lower ratings should be considered.

6. In making assignments from the Depot Brigade to permanent organizations it is important to give each unit its proportion of superior, average, and inferior men. If this is left to chance there will inevitably be "weak links" in the army chain. Exception to this rule should be made in favor of certain arms of the service which require more than the ordinary number of mentally superior men; for example, Signal Corps, Machine Gun, Field Artillery and Engineers. These organizations ordinarily have about twice the usual proportion of "A" and "B" men and very much less than the usual proportion of "D" and "D−" men.

The first two columns in the following table illustrate the distribution of intelligence ratings typical of infantry regiments and also the extreme differences in the mental strength of organizations which are built up without regard to intelligence ratings. The last column to the right shows the balanced distribution of intellectual strength which might have been attained in each of these two regiments.

Intelligence rating	*Interpretation*	*Two Actual distributions* 1st Regt.	2d Regt.	*A Balanced distribution*
A	Very superior	1.0%	6.0%	3.5%
B	Superior	3.0	12.0	7.5
C+	High average	7.0	20.0	13.5
C	Average	15.0	28.0	21.5
C−	Low average	25.0	19.0	22.0
D	Inferior	31.0	13.0	22.0
D−	Very inferior	18.0	2.0	10.0

Unless intelligence is wisely distributed certain regiments and companies will take training much more slowly than others and thus delay the program of the whole organization.

7. "D" and "D−" men are rarely suited for tasks which require special skill, resourcefulness or sustained alertness. It is also unsafe to expect "D," "D−" or "E" men to read or understand written directions.

8. Only high-score men should be selected for tasks which require quick learning or rapid adjustments.

9. It should not be supposed that men who receive the same mental rating are necessarily of equal military worth. A man's value to the service should not be judged by his intelligence alone.

10. The intelligence rating is one of the most important aids in the rapid sorting of the masses of men in the Depot Brigade. In no previous war has so much depended on the prompt and complete utilization of the mental ability of the individual soldier. It is important, therefore, that the psychological ratings be regularly used as an aid in the selection, assignment, and classification of men.

The various figures which follow are presented not as a summary of the results of psychological examining in the army but instead as samples of these results, the chief value of which is to indicate their principal relationships and practical values.

The sample distribution curves of Figure 1 indicate the value of mental ratings for the identification and segregation of dif-

ferent kinds of military material. The illiterate group of this figure was examined by means of beta, all other groups by means of alpha.

The psychological ratings have proved valuable not so much because they make a better classification than would come about in the course of time through natural selection but chiefly because they greatly abbreviate this process by indicating immediately the groups in which suitable officer material will be found, and at the same time those men whose mental inferiority

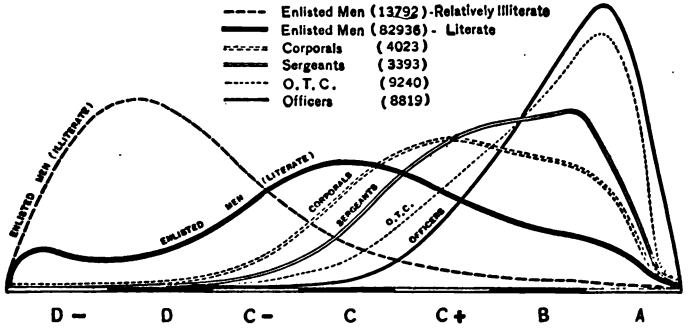


FIGURE 1.—The distribution of intelligence ratings in typical army groups, showing the value of the tests in the identification of officer material.

warrants their elimination from regular units in order to prevent the retardation of training. Speed counts in a war that costs fifty million dollars per day.

Comparison of various military groups distinguished from one another by actual attainment in the service shows that the psychological tests discriminate between these groups with definiteness. This point may be illustrated by reference to the percentages of men of different groups making A and B grades in examination alpha: officers, 83.0 per cent; officers' training school candidates, 73.2 per cent; sergeants, 53.4 per cent; corporals, 39.7 per cent; literate privates, 18.8 per cent. The comparison of measures of central tendency reveals equally striking

differences. Moreover, within the officer group itself significant differences appear for different branches of the service.

The relation of success or failure in officers' training schools to intelligence ratings is exhibited by Figure 2, in which it is to be noted that elimination through failure in the school increases rapidly for ratings below C+. Of men rating above C+, 8.65 per cent were eliminated; of those below C+, 58.27 per cent. The data for this figure were obtained from three schools with a total enrollment of 1,375 men.

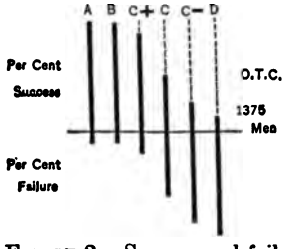


FIGURE 2.—Success and failure in officers' training schools.

Similarly Figure 3 shows the relation between success or failure in non-commissioned officers' training schools and intelligence ratings. The elimination increases rapidly for grades below C+. Of men rating above C, only 18.49 per cent were eliminated; of men rating below C, 62.41 per cent. The results presented in this figure were obtained from four schools with a total enrollment of 1,458 men.

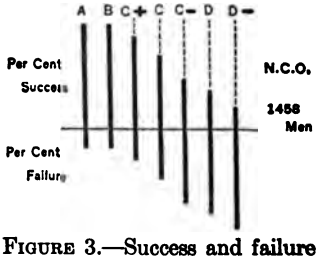


FIGURE 3.—Success and failure in non-commissioned officers' training schools.

Increasingly extensive and effective use has been made of the psychological rating as an aid in the selection of men for officers' training schools, non-commissioned officers' training schools and other lines of training or service which require special ability. It has been convincingly demonstrated that the data of psychological examinations can readily be used to diminish the necessary elimination during training and thus to increase the efficiency of the schools.

The extreme differences in the intellectual status of army

ıps are fairly indicated by Figure 4, which presents the data groups whose military importance cannot readily be over-›hasized. Roughly, the groups in the upper half of the

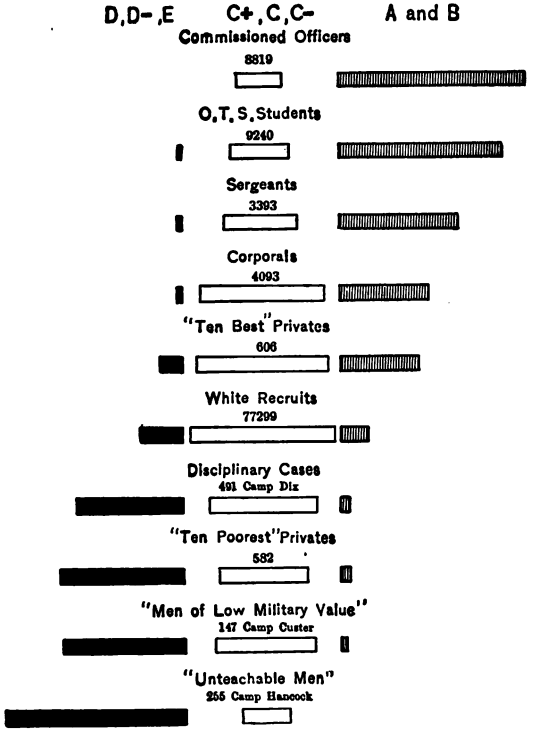


FIGURE 4.—Purportion of low, average and high-grade men in typical groups.

ıre are important because of their relatively high intelligence l the mental initiative demanded for success, whereas those the lower half of the figure are important because of poor ɛlligence and relative inefficiency or uselessness.

These results suggest that if military efficiency alone were to

be considered, the Army would undoubtedly gain largely by rejecting all "D—" and "E" men. This procedure would greatly lessen the group of disciplinary cases so troublesome and costly in the military organization and also the group which in the figure is distributed among "ten poorest privates," "men of low military value" and "unteachable men."

Numerous varieties of evidence indicate the extreme military importance of the prompt recognition of low-grade men. The percentages of men ranking below the average in psychological examinations are notably large for the disciplinary group, men having difficulties in drill, men reported as "unteachable" and men designated by their officers as "poorest" from the standpoint of military usefulness.

The comparison of negro with white recruits reveals markedly lower mental ratings for the former.[1] A further significant difference based on geographical classification has been noted in that the northern negroes are mentally much superior to the southern.

The relation between officers' judgments of the value of their men and intelligence ratings is exhibited in somewhat different ways by Figures 5 to 7. Thus the median scores for five groups of privates arranged in order of military value from "very poor" to "best" are presented in Figure 5. The total number of individuals in the group is 374.

The men were selected from twelve different companies, approximately thirty men in each company being ranked by an officer in serial order from "best" to "poorest." The rank order for each company was then correlated by the psychological examiner with the rank order supplied by psychological examination. In seven of the twelve companies the correlations ranged from .64 to .75. The average correlation was .536. These correlations are high, considering the large number of factors which may influence a man's value to the service.

The median score for the "very poor" group of Figure 5 is 28 points in an examination whose maximal score is 212 points. By

contrast with this, the median score of the "best" group of privates is 99 points.

The commanding officers of ten different organizations, representing various arms of the service, in a certain camp were asked to designate (1) the most efficient men in their organizations, (2) the men of average ability and (3) men so inferior that they are "barely able" to perform their duties.

The officers of these organizations had been with their men from six to twelve months and knew them exceptionally well. The total number of men rated was 965, about equally divided among "best," "average," and "poorest." After the officers' ratings had been made, the men were given the usual psychological test. Comparison of test results with officers' ratings showed:

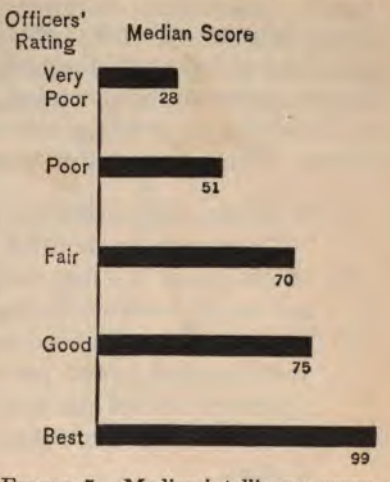


FIGURE 5.—Median intelligence scores (by points) of groups designated as best, good, fair, poor, and very poor in military value.

(*a*) That the average score of the "best" group was approximately twice as high as the average score of the "poorest" group.

(*b*) That of men testing below C−, 70% were classed as "poorest" and only 4.4% as "best."

(*c*) That of men testing above C+, 15% were classed as "poorest" and 55.5% as "best."

(*d*) That the man who tests above C+ is about fourteen times as likely to be classed "best" as the man who tests below C−.

(*e*) That the per cent classed as "best" in the various groups increased steadily from 0% in D− to 57.7% in A, while the per cent classed as "poorest" decreased steadily from 80% in D− to 11.5% in A.

In an infantry regiment of another camp were 765 men (regulars) who had been with their officers for several months. The company commanders were asked to rate these men as 1, 2, 3, 4, or 5 according to "practical soldier value," 1 being highest and 5 lowest. The men were then tested, with the following results:

(*a*) Of 76 men who earned the grade A or B, none was rated "5" and only 9 were rated "3" or "4."
(*b*) Of 238 D and D− men, only one received the rating "1," and only 7 received a rating of "2."
(*c*) Psychological ratings and ratings of company commanders were identical in 49.5 per cent of all cases. There was agreement within one step in 88.4 per cent of cases, and disagreement of more than two steps in only .7 per cent of cases.

Figure 6 exhibits a striking contrast in the intelligence status and distribution of "best" and "poorest" privates. The personal judgment data for this figure were obtained from sixty company commanders who were requested to designate their ten "best" and their ten "poorest" privates. Of the "poorest," 57.5 per cent graded D or D−; less than 3 per cent graded A or B. The results suggest that intelligence is likely to prove the most important single factor in determining a man's value to the military service.

In one training camp excellent opportunity was offered to compare a group of soldiers selected on the basis of low military value with a complete draft quota. In the "low value" group there were 147 men, in the complete draft quota 12,341 men. The distribution of intelligence ratings for these two military groups appear as Figure 7, from which it is clear that if all men

with intelligence ratings below C— had been eliminated, the "low value" group would have been reduced by at least half.

In a certain training camp 221 inapt soldiers, belonging to a negro regiment of Pioneer Infantry, were referred by their commanding officer for special psychological examination. Nearly one-half (109) of these men were found to have mental ages of seven years or less. *The Army nevertheless had been attempting to train these men for military service.* In justice to the Psycho-

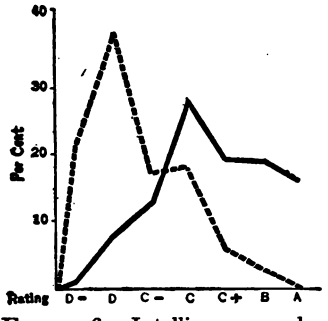


FIGURE 6.—Intelligence grades of best (——) and poorest (- - - -) privates (best, 606; poorest, 582; total 1,188).

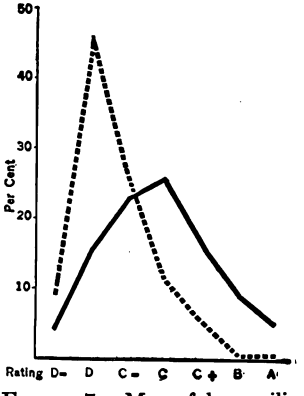


FIGURE 7.—Men of low military value (- - -) 147, compared with a complete draft quota (——), 12,341.

logical Service it should be stated that these negroes had been transferred from camps where there were no psychological examiners; for this reason they had not been examined before being assigned to an organization for regular training.

In another instance some 306 soldiers from organizations about to be sent overseas were designated by their commanding officers as unfit for foreign service. They were referred for psychological examination with the result that 90 per cent were discovered to be ten years or less in mental age, and 80 per cent nine years or less.

It has been discovered that when soldiers are assigned to

training units without regard to intelligence, extreme inequ ities in the mental strength of companies and regiments appe This fact is strikingly exhibited by Figures 8 and 9, of which former shows the proportions of high grade and of illiterate foreign soldiers in the various companies of an infantry r

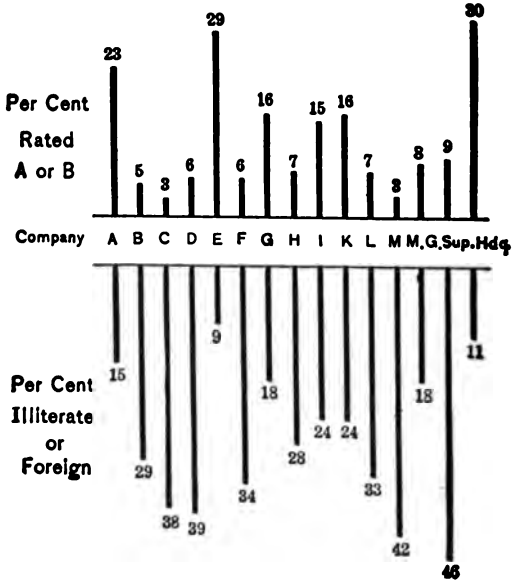


FIGURE 8.—Inequality of companies in an infantry regiment.

ment. Compare, for example, the intelligence status of C E companies. The former happens to have received onl per cent of A and B men along with 38 per cent of illiterates foreigners; the latter received by contrast 29 per cent of h grade men with only 9 per cent of men who are as a rule diffi to train. It is needless to attempt to emphasize the mili importance of this condition. The tasks of the officers of t two companies are wholly incomparable. But more ser even than the inequalities in response to training are the i

of weak points in the army chain as a result of such random or unintelligent assignment.

Naturally enough the officers of the Army were quick to appreciate the disadvantages of a method of assigning recruits which permits such extreme inequalities in mental strength to appear and persist. They promptly demanded the reorganization of improperly constituted units and assignment in accordance with intelligence specifications so that the danger of weak links in the chain and of extreme difference in rapidity of training should be minimized.

That serious inequalities existed in regiments as well as in smaller units prior to assignment on the basis of intelligence is proved by the data of Figure 9, which pictures the differences found in four infantry regiments and three regiments of field artillery.

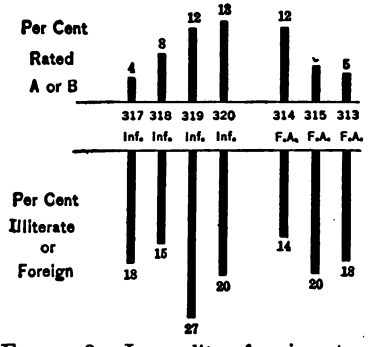


FIGURE 9.—Inequality of regiments.

Following the demonstration of the value of psychological ratings in connection with assignment, the experiment was tried in various training camps of classifying men in accordance with intelligence for facilitation of training. To this end A and B grade men were placed in one training group, C+, C and C− men in another, and D and D− men in a third. The three groups were then instructed and drilled in accordance with their ability to learn. Thus delay in the progress of high-grade men was avoided and the low-grade soldiers were given special instruction in accordance with their needs and capacity.

The marked differences in the mental strength of groups in different officers' training schools are shown by Figure 10. For the eighteen schools of this figure, the proportion of A grades varies from 16.6 per cent to 62.4 per cent; the proportion of A

and B grades combined, from 48.9 per cent to 93.6 per cent; and the proportion of grades below C+, from 0 to 17.9 per cent. Since it is unusual for a man with an intelligence rating below C+ to make a satisfactory record in an officers' training school, it is clear that the pedagogic treatment of these several student groups should differ more or less radically and that elimination must vary through a wide range if the several schools are to graduate equally satisfactory groups of officers.

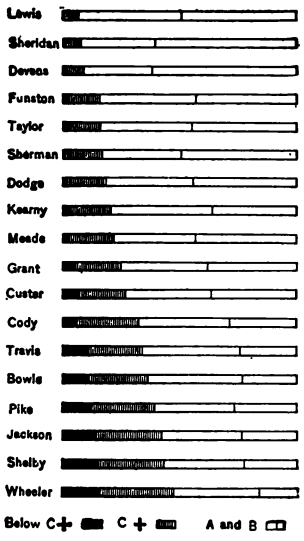


FIGURE 10. — Inequality of mental strength in eighteen officers' training schools, 4th series (total enrollment 9,240).

Far more important than the contrast in student officers' training groups noted above are the differences in the intelligence status of officers in different arms of the service as revealed by psychological examining. Figure 11 exhibits the data obtained for several groups. The variations are extreme and seemingly unrelated to the requirements of the service. Medical officers, for example, show a relatively large percentage of men rating C+ or below, whereas engineering officers head the list with relatively few men whose intelligence is rated below B. There is no obvious reason for assuming that the military duties of the engineer demand higher intelligence or more mental alertness than do those of the medical officer. Since it is improbable that any arm of the service possesses more intelligence than can be used to advantage, the necessary inference is that certain arms would benefit by the elimination of low-grade men and the substitution of officers with better intellectual ability.

Table 1 summarizes the general classification obtained by the psychological examination. The column headed "White draft" is a random sampling of the 1,726,000 men examined. The column headed "Recruits" is a small group, brought out by

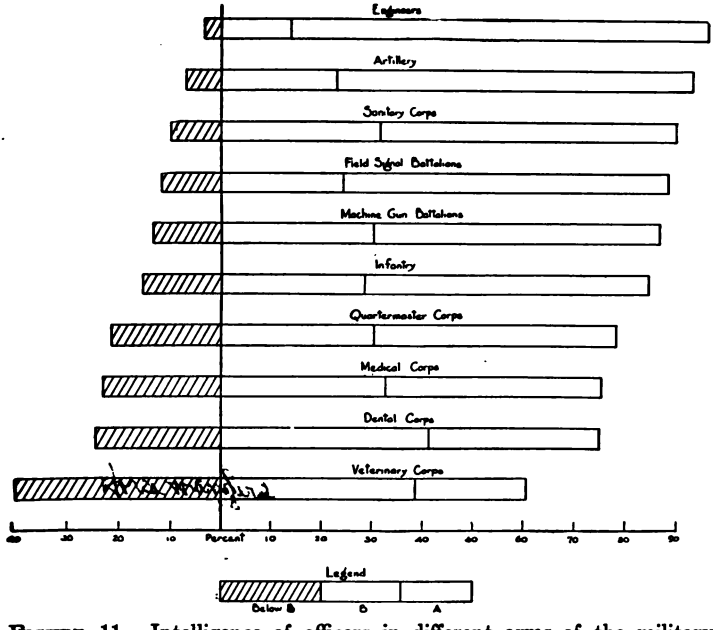


FIGURE 11.—Intelligence of officers in different arms of the military service.

the Hollerith sorting, no longer in the Depot Brigade but not yet assigned to regular organizations. "Privates" designates a random selection of men reported as being in named organizations, such as Infantry, Artillery, Machine Gun, etc. The other columns are self-explanatory. They do not represent exactly the same method of sampling but are clearly typical of the differences revealed by other methods of sampling described and represented in the figures above. The group headed "Sergeants" includes all classes of sergeants. Medical officers are

TABLE 1

Relation of Intelligence Rating to Rank

Enlisted Men and Officers

Score	*White draft*	*Recruits*	*Privates*	*Corporals*	*Sergeants*	*2nd Lieut.*	*1st Lieut.*	*Captains*	*Majors*	*Above Majors*
A.....	4.1	7.4	9.3	16.1	24.0	59.4	51.7	53.4	64.4	63.6
B.....	8.0	11.1	14.6	26.2	26.5	27.1	29.7	29.0	25.0	25.1
C+.....	15.2	14.7	21.2	27.7	25.4	10.9	13.8	14.4	9.2	8.9
C.....	25.0	20.7	25.8	19.3	16.8	2.4	3.7	3.8	1.5	2.5
C−.....	23.8	21.1	16.1	8.7	5.8	0.2	0.5	0.4	0.2	0
D.....	17.0	17.0	15.6	9.7	1.8	1.5	0	0	0.1	0
D−.....	7.1	9.5	3.9	0.6	0.5	0	0	0	0	0
No. of cases.	94,004	620	15,647	1,482	1,863	5,590	5,908	3,023	517	159
Per cent beta.	29.7	28.0	14.3	2.7	1.6	0	0	0	0	0

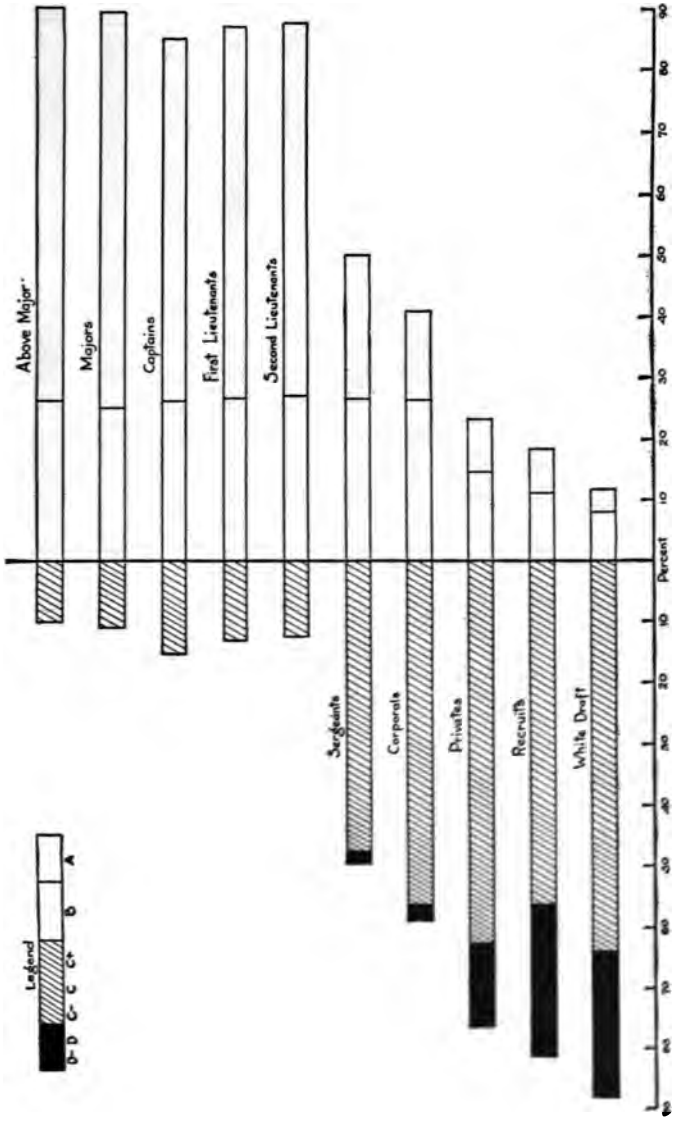


FIGURE 12.—Relation of intelligence to rank.

included in the percentages given. With the medical officers omitted practically no correlation with rank appears. The medical officers taken alone show a high correlation with rank. It has been suggested that this represents the professional grading that has already been made in civil life.

Figure 12 presents the percentages of Table 1 in graphic form. The different grades and ranks are shown according to the letter grade classification given in the table. The dividing line is placed between C+ and B.

Further evidence indicates that the tests prophesy success in field operations. When the classification made by them is compared with total value to the service after a year of training and actual fighting the correspondence is still positive, and an average statistical prophecy of attainment exists. The degree of practical success in the application of such a measure may well be considered one of the major achievements of the war.

CHAPTER III

EXAMINER'S GUIDE FOR PSYCHOLOGICAL EXAMINING IN THE ARMY

DIRECTIONS FOR GIVING THE ARMY MENTAL TESTS

Prepared especially for military use by the Subcommittee on Methods of Examining Recruits of the Psychology Committee of the National Research Council

Revised by direction of the Surgeon General of the Army and printed by the Medical Department, U. S. A., September, 1917
Second revision, July, 1918

CONTENTS

	Page
I. Introductory statement	43
1. Purposes of psychological examination	43
2. General plan of examination	43
3. Organization and routine	45
4. Utilization of results	47
5. Conferences with officers	49
II. Segregation of illiterates	51
III. Group examination alpha	53
1. Procedure	53
2. Directions for scoring [keys]	66
3. Total score and rating	78
IV. Group examination beta	79
1. Directions for setting up apparatus	79
2. Procedure	80
3. Directions for scoring	88
4. Total score and rating	91
V. Individual examinations	92
1. General directions	92
2. Point scale examination	96
(*a*) Procedure	96
(*b*) Adaptation for use with illiterates	96
(*c*) Expressing and interpreting results	96
3. Stanford-Binet examination	98
(*a*) Procedure	98
(*b*) Adaptation for use with illiterates	98
(*c*) Expressing and interpreting results	99
4. Performance scale examination	100
(*a*) Procedure	100
(*b*) Procedure for non-English-speaking subjects.	120
(*c*) Directions for using record blank	123
(*d*) Directions for weighting	124
(*e*) An abbreviated performance scale	126
(*f*) Expressing and interpreting results	127
5. Mechanical skill test	128
Appendix A.—Table of equivalent scores	133
Appendix B.—Examiner's outfit	135
Appendix C.—Building and equipment	137

I. INTRODUCTORY STATEMENT

1. PURPOSES OF PSYCHOLOGICAL EXAMINATION

(*a*) To classify soldiers according to their mental ability, thus supplementing personnel records of occupational qualifications and assisting with assignment in the Army.

(*b*) To supply a mental rating for each soldier which shall assist personnel officers in building organizations of equal or of appropriate mental strength.

(*c*) To assist regimental, company and medical officers by careful examination and report on men who are not responding satisfactorily to training, or are otherwise troublesome.

(*d*) To assist officers of development battalion with classification, grading, training, and ultimate assignment of men.

(*e*) To assist in discovering men of superior mental ability who should be selected for officers' training camps, for promotion or for assignment to special tasks.

(*f*) To assist in discovering and properly placing men of marked special skill, as for example, observers or scouts for intelligence service.

(*g*) To assist in discovering men who are mentally inferior and who in accordance with degree of defectiveness should be recommended for discharge, development battalions, labor organizations or regular military training.

2. GENERAL PLAN OF EXAMINATION

(1) Segregation of men obviously illiterate.

(2) Group examination alpha (for literates):

Time, 40 to 50 minutes.

Number, 100 to 200 men in a group.

(3) Group examination beta (for illiterates and men failing in examination alpha):

Time, 50 to 60 minutes.

Number, up to 60 men in a group.

(4) Individual examinations (for men failing in beta, or referred):

Point-scale examination.
Stanford-Binet examination.
Performance-scale examination.
Time, 15 to 60 minutes.

Mechanical skill examination (supplementary):
Time, 15 to 30 minutes.

The order of procedure is as follows:

(*a*) A group consisting of 100 to 200 men will report to the psychological examiner at designated room for examination alpha.

(*b*) Men who cannot read and write English at all should first be eliminated from this group by directing those who cannot read or write to stand, and by observing the manner in which the remainder fill out the headings of the examination alpha blank. Those who are eliminated should be sent to the special beta examining room; the remainder should be given examination alpha.

(*c*) Men found later to have made scores of less than 15 (raw score) in examination alpha should be given examination beta.

(*d*) Individuals rated D− after beta or after alpha and beta will report by appointment for individual examination. It is estimated that not over 5 per cent of the strength of an organization should require individual psychological examination.

Summary.—All enlisted men take either alpha or beta. Those who can read and write English, take alpha immediately. Those who cannot, take beta immediately. Those who make scores of less than 15 in alpha take beta. All who fail in beta take individual examination. The form of individual examination given varies with the characteristics of the subject. Point-scale or Stanford-Binet examination may be given to subjects who are able to understand English fairly well. To all other

subjects performance-scale examination should be given either alone or in addition to one of the other scales.

3. ORGANIZATION AND ROUTINE

The value of these examinations will depend upon the perfection of organization and the efficiency of the routine procedure which is developed by the examining staff. The following points are especially important:

(*a*) Previous arrangement should insure the prompt reporting of men either by groups or individually at a given time and place for prescribed examination. Company officers accompanying groups to be examined, should be asked to list men who give trouble, or whom they would like to see examined individually; reasons and company record should be noted in each case.

(*b*) Group and individual examination blanks should be scored and recorded as promptly as possible, and ratings prepared for immediate report. The chief psychological examiner is responsible for one complete file of all examinations, to be kept in easily accessible form by organizations. All available lists of names, such as company rosters, personnel officer lists, etc., should be used by examiners to simplify and to increase the accuracy of the reports. Time will often be saved by typing or writing scores directly on such lists, especially if they can be obtained in duplicate or triplicate.

(*c*) The intelligence rating of every man examined should be reported promptly to Personnel Officer, with comment concerning any special aptitude noted. Company commanders should also have all available information as soon as men are assigned.

(*d*) All cases of mental deficiency, as well as all cases for which neuro-psychiatric examination is especially indicated, should be referred promptly to the psychiatrist through the camp or division surgeon. Complete report of psychological examination, on blank furnished for the purpose, must accom-

pany every such case, whether referred for discharge, assignment to special organization, or neuro-psychiatric examination.

(*e*) Psychological record card, complete with recommendation and disposition of case, and report on cases recommended for neuro-psychiatric examination should be forwarded to the Surgeon General's Office, Division of Psychology, after the soldier has left camp.

(*f*) Weekly statistical sheet should be sent promptly on or before Tuesday of each week to Surgeon General's Office. It should be supplemented by such letter statements and special reports as seem desirable.

(*g*) Every effort should be made to coöperate as fully and effectively as possible with all officers of the camp or division for the increased efficiency of the Army.

February 2, 1918, the following instructions were issued, by the divisions concerned, to promote coöperation and increase the efficiency of the psychological and neuro-psychiatric services:

PROVISION FOR COÖRDINATION OF PSYCHIATRIC AND PSYCHOLOGICAL EXAMINATIONS IN DIVISIONAL TRAINING CAMPS

It is agreed between the Division of Psychology and the Division of Neuro-psychiatry:

(1) That psychiatric survey of organizations shall be made in conjunction with psychological survey.

(2) That for this purpose psychiatric examiners shall be present at group psychological examinations, to observe the behavior and appearance of soldiers. It is further provided that the work of the psychiatrist shall not interfere with the proper conduct of psychological examination.

(3) That rooms numbered 5 and 6 in Psychology Building shall be designated for psychiatric examining.

(4) That the name, rank, and organization of individuals receiving grade E in group psychological examination shall be reported promptly to the division psychiatrist through the division surgeon.

(5) That report of individual psychological examination shall be accepted by psychiatrist as part of the medical examination and shall

be included in the case record if subject be recommended for discharge or for special assignment.

PEARCE BAILEY,
Major, M. R. C., Chief of Division of Neuro-psychiatry.
ROBERT M. YERKES,
Major, S. C., N. A., Chief of Division of Psychology.

4. UTILIZATION OF RESULTS

Psychological ratings should be valuable alike to personnel officers, line officers, and medical officers. To the first, as partial basis for placement of soldiers; to the second, as supplementary information for guidance in connection with training, or special treatment of men who give trouble; and to the third, as partial basis for recommendation for discharge, special examination, or medical treatment.

The results of examination should be made available to these officers as early as possible. It is therefore the duty of the psychological examiner to see that every drafted man is examined as promptly as possible after arrival in camp, and that report is immediately made to the personnel officer, to the medical officer if the case requires it, and subsequently to the company commander to whom the man is assigned.

The draft contains an adequate number of high-grade men to fill positions of responsibility. The psychological examination helps to reveal non-commissioned officer material and suitable candidates for officers' training camps. It also supplies partial basis for assignment of men to specific trades or occupations in the Army. In making selections for training in any specialized branch of military service it will probably be wise to select individuals whose intelligence scores are well above the lower quartile for the occupation in question. Apart from inequalities in experience or special training, the difference in the scores of two men will, in a general way, indicate their relative value for assignment to a specific trade or occupation.

Emphasis should be placed upon the desirability of balancing

the special trades and occupations in the various companies and regiments. Each unit should have its proper share of high, medium, and low-grade men for special assignments as well as for the ranks. It is evident that the ultimate value of the psychological service in balancing the units will depend very largely upon the establishment of proper coöperative relations with personnel officers. Frequent conferences with the personnel officers should be held, and ways and means considered for securing effective coördination of effort.

To be of the greatest value the psychological examination should be given at the earliest possible date after the arrival of the men in camp, in order that the personnel officer may have the results on the qualification cards when making assignments. Unless the scores are available and used properly at this time, companies will be built up that are very uneven in general intelligence. In order to balance companies and regiments satisfactorily it is necessary to observe not only the special requirements laid down in the tables of organization, but also the requirement that there shall be equivalent grades of intelligence in company organizations and in the various trades and occupations demanded in each.

Coöperative relations should be established between psychiatrists and psychological examiners in order that company commanders and personnel officers may obtain promptly detailed information concerning any individual recruit. The lower grades of mental capacity are clearly indicated by the alpha and beta examinations. The lowest cases should be given individual examination with the least possible delay. Company commanders should be encouraged to refer for examination men whose drill or conduct is unsatisfactory. Where development battalions have been formed special study should be made of the results of the development work in the case of men of various grades of intelligence. The psychological service should be able to make an effective contribution in the handling of development units.

5. CONFERENCES WITH OFFICERS

In order that the results of examinations may be used effectively, it is necessary that psychological examiners take pains to acquaint all officers in their stations with the nature and uses of intelligence ratings. To this end, conferences with groups of officers, by regiments or other convenient unit, should be arranged by the chief psychological examiner. In these conferences the methods of examining should be explained clearly and simply, and the possible ways of using psychological information described and illustrated. The examiner should strive especially to take the military point of view. Unwarranted claims concerning the accuracy of the results should be avoided. In general, straightforward common-sense statements will be found more convincing than technical descriptions, statistical exhibits, or academic arguments.

In order to make such conferences of the greatest value, the views and criticisms of officers should be elicited as fully as possible. In this way misunderstandings will be cleared up and the way paved for effective coöperation.

The criticisms most likely to arise are the following: (1) That the score made is greatly influenced by such accidental factors as fatigue, homesickness, illness, time of day, etc. (2) That the tests do not measure real ability, but instead merely reflect the man's educational and social advantages. (3) That the score may be greatly influenced by coaching or by a repetition of the test.

While it has been well enough established that such factors as these are not present in a sufficient degree to invalidate seriously the test results, their presence cannot be denied. It can hardly be claimed that the mental or physical condition of the subject and the circumstances under which the test is given have no effect upon the score. Similarly, it would be unreasonable to suppose that the result is wholly uninfluenced by educational advantages. While coaching is not likely to in-

validate the results to any great extent in army testing, it is nevertheless a factor which should be carefully guarded against by measures designed to prevent the dissemination of blanks. As regards practice effects, it has been found that the average gain in a repeated alpha examination is approximately 8 points (raw score). The P. E. of an alpha raw score is approximately 5 points. While cases will admittedly occur in which men will receive a rating on the psychological examination somewhat higher or lower than they deserve, this would occur on any method of classification that might be used. It may well be emphasized that the psychological examination furnishes for immediate use a rating of the men which in validity compares not unfavorably with ratings furnished by officers after months of acquaintance.

In using the psychological results there is a tendency to overlook the fact that they give evidence concerning but one quality important in a good soldier. The company commander should be cautioned not to neglect the importance of other qualities, such as personal appearance, energy, military experience, leadership, initiative, tact, etc. It is no criticism of the psychological rating that it fails to measure these other qualities of the soldier. All it does is to afford a reasonably reliable measure of one essential quality—i. e., general intelligence. Although there is a fairly high correlation between general intelligence and other desirable traits, like character, leadership, etc., the fact must not be overlooked that there are individuals of high intelligence who are not properly fitted to command. It has been proved quite definitely that the results of the psychological examinations are valuable when properly used. They cannot, however, be made to take the place of all other criteria. Each officer should be encouraged to scrutinize the men of his command carefully in order to discover their individual differences in other traits as well as in intelligence.

Individual cases will be found in which the information of the company commander is greatly at variance with the psycho-

logical rating. In such cases one would not be warranted in making sweeping claims for the infallibility of the test results. It should be pointed out that the discrepancy may be due to the presence or absence of important traits not measured by the intelligence examination. Such cases, however, afford opportunity for the psychological examiner to make clear the value of a rating which is absolute rather than relative. The company commander will readily appreciate the fact that his own estimate is relative; that he inevitably judges his men with reference to the average in his company. For this reason in the company which in general is inferior a high man will be overestimated. Similarly, in a specially high company a low man will be underestimated. Company commanders will readily appreciate the importance of bringing to light extreme cases of unevenness in different organizations in order that such inequalities may be remedied.

II. SEGREGATION OF ILLITERATES

Subjects reporting for group examination belong in one of the following classes:

(1) Men totally illiterate or unable to understand English;
(2) Men who read or write English only with difficulty;
(3) Men who read and write English readily.

Examination alpha will not measure the intelligence of the first group; it may or may not yield a reliable measure for the second group; it will measure the intelligence of the third group.

Group 1 should be given beta only; group 3 should be given alpha (but not beta unless the score earned in alpha was below D); group 2 should be given both alpha and beta in order that men making below D in alpha because of language difficulty may have opportunity to improve their scores in examination beta.

Examiners should eliminate at the outset of examination alpha

all total illiterates and men who cannot understand English, by ordering these to stand and to leave the alpha room. They may then be referred to examination beta. Officers' statements that men cannot read and write may be used to advantage in making this separation.

After these men have been segregated and the remaining group satisfactorily placed, each man is supplied with a pencil. Then E. should say: "We are going to pass around some papers now; don't turn any of the pages until I tell you to." Have assistants distribute alpha booklets, face up, making sure that only one is handed to each man. As soon as the booklets have been distributed E. should continue, slowly and distinctly, pausing after each instruction to give subjects time to respond: "Now, at the top of the page before you, print your name after the word 'Name.' Print your first name first, then your middle initial, if any, and then your last name. Take time to print very *plainly*."

After name has been written, say: "Put your rank in the Army after the word 'Rank,' such as private, corporal, sergeant, sergeant first class," etc. "Put your age in years after the word 'Age.'" "In the next line write your company, regiment, arm, and division." (E. should mention designation of these.)

"In the next line write the name of the state or country in which you were born." "If you were not born in this country, tell next the number of years you have lived in the United States." "After 'Race' write the word 'White.'" (In examining negro troops substitute the word "Negro." If there are Indians in the group, ask them to write the word "Indian." Similarly for Chinese, Japanese, Filipinos, etc.)

"In the next line after 'Occupation,' write your usual work, trade or business (such as carpenter, grocery clerk, laborer, farmer, student)." "Next put down how much you earned a week before you entered the Army; not how much a *day* or a *month*, but how much a *week*."

"After 'Schooling,' draw a line under the highest grade or school you attended. For example, if the highest grade you attended was the fifth grade, draw a line under Grade 5; if you attended the second year in the high school or preparatory school, draw a line under High School, Year 2, etc."

After these directions have been given, the orderlies should systematically examine the paper of each man to discover his ability to carry out the above directions. Those subjects who are unable to read and write sufficiently to fill out these headings should be commanded to stand, and on completion of preliminary survey by examiner and his assistants should be ordered to enter examining room for examination beta.

The above direction is based upon the assumption that a man who cannot understand the directions given by E., read the words "occupation," "weekly wages," "schooling," etc., and write the necessary replies, cannot do justice to himself in examination alpha.

III. GROUP EXAMINATION ALPHA

1. PROCEDURE

Examination alpha is to be given to all subjects who remain in the room after the elimination of illiterates. In giving the following directions E. should speak rather slowly, distinctly, and with proper emphasis. *He should expect and demand perfect order and prompt response to commands.*

When everything is ready E. proceeds as follows: "Attention! The purpose of this examination is to see how well you can remember, think, and carry out what you are told to do. We are not looking for crazy people. The aim is to help find out what you are best fitted to do in the Army. The grade you make in this examination will be put on your qualification card and will also go to your company commander. Some of the things you are told to do will be very easy. Some you may find hard. You are not expected to make a perfect grade, but do the very best you can.

"Now, in the Army a man often has to listen to commands and then carry them out exactly. I am going to give *you* some commands to see how well you can carry them out. Listen closely. Ask no questions. Do not watch any other man to see what *he* does.

"Look at your papers. Just below where you have been writing, there are several sets of forms—circles, triangles, and so forth. First you will be told to do something with the circles at 1, afterwards with the circles at 2, and so on.

"When I call 'Attention,' stop instantly whatever you are doing and hold your pencil up—so. Don't put your pencil down to the paper until I say 'Go.' (Examiner lowers his pencil.) Listen carefully to what I say. Do just what you are told to do. As soon as you are through, pencils up. Remember, wait for the word 'Go.'"

N. B. Examiner.—Give the following instructions very distinctly and at moderate speed. After giving the command "Attention," always notice carefully and have orderlies notice whether all pencils are up. Never proceed until they are. This is especially important in the beginning. Be careful to use the directions that fit the *form* of alpha booklet distributed. Be careful not to pause or to drop the voice in the course of a compound direction, e. g., in 3, before the words "and also." Raise your pencil whenever you say "Attention." Lower it promptly whenever you say "Go."

Test 1, Form 5

1. "Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go' but not before, make a cross in the first circle and also a figure 1 in the third circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers in them. When I say 'go' draw a line from Circle 1 to Circle 4 that will pass *above* Circle 2 and *below* Circle 3.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go' make a cross in the space which is in the triangle but not in the square, and also make a figure 1 in the space which is in the triangle and in the square.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go' make a figure 1 in the space which is in the circle but not in the triangle or square, and also make a figure 2 in the space which is in the triangle and circle, but not in the square.—Go!" (Allow not over 10 seconds.)

(*N. B. Examiner.*—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If a machine gun can shoot more bullets a minute than a rifle, then (when I say 'go') put a cross in the second circle; if not, draw a line *under* the word NO.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go' put in the second circle the right answer to the question: 'How many months has a year?' In the third circle do nothing, but in the fourth circle put any number that is a wrong answer to the question that you have just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go' *cross out* the letter just before C and also draw a line *under* the second letter before H.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go' make in the *first* circle the *first* letter of the *first* word: in the *second* circle the first letter of the second word, and in the *third* circle the *last* letter of the *third* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go' *cross out* each number that is more than 20 but less than 30.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go' put a 3 or a 2 in each

of the two largest parts and any number between 4 and 7 in the part next in size to the smallest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go' draw a line through every even number that is not in a square, and also through every odd number that is in a square with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 7 is more than 5, then (when I say 'go') cross out the number 6 unless 6 is more than 8, in which case draw a line *under* the number 7.—Go!" (Allow not over 10 seconds.)

"During the rest of this examination don't turn any page forward or backward unless you are told to. Now turn over the page to Test 2."

Test 1, Form 6

1. "Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go' but not before, make a cross in the second circle and also a figure 1 in the third circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers in them. When I say 'go' draw a line from Circle 2 to Circle 5 that will pass *above* Circle 3 and *below* Circle 4.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go' make a cross in the space which is in the square but not in the triangle, and also make a figure 1 in the space which is in the triangle and in the square.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go' make a figure 1 in the space which is in the triangle but not in the circle or square, and also make a figure 2 in the space which is in the square and circle, but not in the triangle.—Go!" (Allow not over 10 seconds.)

(*N. B. Examiner.*—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If a regiment is bigger than a company, then (when I say 'go') put a cross in the first circle; if not, draw a line *under* the word NO.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go' put in the second circle the right answer to the question: 'How many months has a year?' In the fourth circle do nothing, but in the fifth circle put any number that is a wrong answer to the question that you just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go' *cross out* the letter just before D and also draw a line *under* the second letter before I.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go' make in the *first* circle the *last* letter of the *first* word; in the *second* circle the *last* letter of the *second* word and in the *third* circle the *third* letter of the *third* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go' *cross out* each number that is more than 30 but less than 40.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go' put a 3 or a 2 in each of the two smallest parts and any number between 4 and 7 in the part next in size to the largest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go' draw a line through every odd number that is not in a circle and also through every odd number that is in a circle with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 6 is more than 4, then (when I say 'go') cross out the number 5 unless 5 is more than

7, in which case draw a line *under* the number 6.—Go!" (Allow not over 10 seconds.)

"During the rest of this examination don't turn any page forward or backward unless you are told to. Now turn over the page to Test 2."

Test 1, Form 7

1. "Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go' but not before, make a figure 1 in the first circle and also a cross in the third circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers in them. When I say 'go' draw a line from Circle 3 to Circle 6 that will pass *above* Circle 4 and below Circle 5.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go' make a figure 1 in the space which is in the triangle but not in the square, and also make a cross in the space which is in the triangle and in the square.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go' make a figure 1 in the space which is in the square but not in the circle or triangle, and also make a figure 2 in the space which is in the circle and triangle, but not in the square.—Go!" (Allow not over 10 seconds.)

(*N. B. Examiner.*—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If a battleship is larger than a submarine, then (when I say 'go') put a cross in the third circle; if not, draw a line *under* the word NO.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go' put in the first circle the right answer to the question: "How many months has a year?' In the third circle do nothing, but in the fourth circle put any number that is a wrong answer to the question

that you just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go' *cross out* the letter just before E and also draw a line *under* the second letter before H.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go' make in the *first* circle the *first* letter of the *first* word; in the *second* circle the *second* letter of the *second* word, and in the *third* circle the *last* letter of the *last* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go' *cross out* each number that is more than 40 but less than 50.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go' put a 4 or a 5 in each of the two smallest parts and any number between 6 and 9 in the part next in size to the largest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go' draw a line through every even number that is not in a circle and also through every odd number that is in a circle with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 5 is more than 3, then (when I say 'go') cross out the number 4 unless 4 is more than 6, in which case draw a line *under* the number 5.—Go!" (Allow not over 10 seconds.)

"During the rest of this examination don't turn any page backward or forward unless you are told to. Now turn over the page to Test 2."

Test 1, Form 8

1. "Attention! "Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go' but not before, make a figure 2 in the second circle and also a cross in the third circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers

in them. When I say 'go' draw a line from Circle 1 to Circle 4 that will pass *below* Circle 2 and *above* Circle 3.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go' make a figure 1 in the space which is in the square but not in the triangle, and also make a cross in the space which is in the triangle and in the square.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go' make a figure 2 in the space which is in the circle but not in the triangle or square, and also make a figure 3 in the space which is in the triangle and circle, but not in the square.—Go!" (Allow not over 10 seconds.)

(*N. B. Examiner.*—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If taps sound in the evening, then (when I say 'go') put a cross in the first circle; if not, draw a line *under* the word NO.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go' put in the first circle the right answer to the question: 'How many months has a year?' In the second circle do nothing, but in the fifth circle put any number that is a wrong answer to the question that you just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go' *cross out* the letter just after F and also draw a line *under* the second letter after I.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go' make in the *first* circle the *last* letter of the *first* word; in the *second* circle the *middle* letter of the second word and in the *third* circle the *first* letter of the *third* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go' *cross out* each number that is more than 50 but less than 60.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go' put a 4 or a 5 in each of the two largest parts and any number between 6 and 9 in the part next in size to the smallest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go' draw a line through every odd number that is not in a square, and also through every odd number that is in a square with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 4 is more than 2, then (when I say 'go') cross out the number 3 unless 3 is more than 5, in which case draw a line *under* the number 4.—Go!" (Allow not over 10 seconds.)

"During the rest of this examination don't turn any page forward or backward unless you are told to. Now turn over the page to Test 2."

Test 1, Form 9

1. "Attention! 'Attention' always means 'Pencils up.' Look at the circles at 1. When I say 'go,' but not before, make a cross in the first circle and also a figure 1 in the last circle.—Go!" (Allow not over 5 seconds.)

2. "Attention! Look at 2, where the circles have numbers in them. When I say 'go' draw a line from Circle 2 to Circle 5 that will pass *below* Circle 3 and *above* Circle 4.—Go!" (Allow not over 5 seconds.)

3. "Attention! Look at the square and triangle at 3. When I say 'go' make a figure 2 in the space which is in the triangle but not in the square, and also make a figure 3 in the space which is in the square and in the triangle.—Go!" (Allow not over 10 seconds.)

4. "Attention! Look at 4. When I say 'go' make a figure 2 in the space which is in the triangle but not in the circle or square, and also make a figure 3 in the space which is in the

square and circle, but not in the triangle.—Go!" (Allow not over 10 seconds.)

(*N. B. Examiner.*—In reading 5, don't pause at the word CIRCLE as if ending a sentence.)

5. "Attention! Look at 5. If a captain is superior to a corporal, then (when I say 'go') put a cross in the second circle; if not, draw a line *under* the word NO.—Go!" (Allow not over 10 seconds.)

6. "Attention! Look at 6. When I say 'go' put in the third circle the right answer to the question: 'How many months has a year?' In the fourth circle do nothing, but in the fifth circle put any number that is a wrong answer to the question that you just answered correctly.—Go!" (Allow not over 10 seconds.)

7. "Attention! Look at 7. When I say 'go' *cross out* the letter just after G and also draw a line *under* the second letter after H.—Go!" (Allow not over 10 seconds.)

8. "Attention! Look at 8. Notice the three circles and the three words. When I say 'go' make in the *first* circle the *third* letter of the *first* word; in the *second* circle the *first* letter of the *second* word and in the *third* circle the *first* letter of the *third* word.—Go!" (Allow not over 10 seconds.)

9. "Attention! Look at 9. When I say 'go' *cross out* each number that is more than 60 but less than 70.—Go!" (Allow not over 15 seconds.)

10. "Attention! Look at 10. Notice that the drawing is divided into five parts. When I say 'go' put a 2 or a 3 in each of the two largest parts and any number between 6 and 9 in the part next in size to the smallest part.—Go!" (Allow not over 15 seconds.)

11. "Attention! Look at 11. When I say 'go' draw a line through every even number that is not in a square, and also through every odd number that is in a square with a letter.—Go!" (Allow not over 25 seconds.)

12. "Attention! Look at 12. If 3 is more than 1, then

(when I say 'go') cross out the number 2 unless 2 is more than 4, in which case draw a line *under* the number 3.—Go!" (Allow not over 10 seconds.)

"During the rest of this examination don't turn any page forward or backward unless you are told to. Now turn over the page to Test 2."

Test 2.—Arithmetical Problems

"Attention! Look at the directions at the top of the page while I read them. 'Get the answers to these examples as quickly as you can. Use the side of this page to figure on if you need to.' I will say stop at the end of five minutes. You may not be able to finish all of them, but do as many as you can in the time allowed. The two samples are already answered correctly.—Ready—Go!"

After **5 minutes,** say "STOP! Turn over the page to Test 3."

Test 3.—Practical Judgment

"Attention! Look at the directions at the top of the page while I read them.

"'This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the *best* answer to each question, as in the sample:

"' Why do we use stoves? Because

☐ they look well

☒ they keep us warm

☐ they are black

"'Here the second answer is the best one and is marked with a cross.

" ' Begin with No. 1 and keep on until time is called.'—Ready —Go!" After $1\frac{1}{2}$ **minutes,** say "STOP! Turn over the page to Test 4."

Test 4.—Synonym—Antonym

"Attention! Look at the directions at the top of the page while I read them." (E. reads slowly.)

"'If the two words of a pair mean the same or nearly the same draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess. The two samples are already marked as they should be.'—Ready—Go!"

After **$1^1/_2$ minutes,** say "STOP! Turn over the page to Test 5." (Pause.) "Now you have to turn your books around this way." (Examiner illustrates the necessary rotation.)

Test 5.—Disarranged Sentences

"Attention! Look at the directions at the top of the page while I read them." (E. reads slowly.)

"'The words *a eats cow grass* in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: *a cow eats grass*, and this statement is true.

"'Again, the words *horses feathers have all* would make a sentence if put in the order *all horses have feathers*, but this statement is false.

"'Below are 24 mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each *would* say if the words were straightened out, but don't write them yourself. Then, if what it *would* say is true draw a line under the word "true;" if what it would say is false, draw a line under the word "false." If you cannot be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.'—Ready—Go!"

After **2 minutes,** say "STOP! Turn over the page to **Test 6.**"

Test 6.—Number Series Completion

(*N. B. Examiner.*—Give these instructions very slowly.)

"*Attention!* Look at the first sample row of figures at the

top of the page—2, 4, 6, 8, 10, 12; the two numbers that should come next are, of course, 14, 16.

"Look at the second sample—9, 8, 7, 6, 5, 4; the two numbers that should come next are 3, 2.

"Look at the third sample—2, 2, 3, 3, 4, 4; the two numbers that should come next are 5, 5.

"Now look at the fourth sample—1, 7, 2, 7, 3, 7; the next two numbers would, of course, be 4, 7.

"Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.—Ready—Go!"

After **3 minutes,** say "STOP! Turn over the page to Test 7."

Test 7.—Analogies

"Attention! Look at the first sample at the top of the page: Sky—blue : : grass—table, *green,* warm, big.

"Notice the four words in heavy type. One of them—*green*—is underlined. Grass is *green* just as the sky is blue.

"Look at the second sample: Fish—swims : : man—paper, time, *walks,* girl.

"Here the word *walks* is underlined. A man walks and a fish swims.

"Look at the third sample: Day—night : : white—red, *black,* clear, pure.

"Here the word *black* is underlined because black is the opposite of white just as night is the opposite of day.

"In each of the lines below the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.—Ready—Go!"

After **3 minutes,** say "STOP! Turn over the page to Test 8."

Test 8.—Information

"Attention! Look at the directions at the top of the page while I read them." (E. reads slowly.)

"'Notice the sample sentence: People hear with the—eyes—ears—nose—mouth. The correct word is *ears*, because it makes the truest sentence. In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you cannot be sure, guess. The two samples are already marked as they should be.'—Ready—Go!"

After **4 minutes,** say "STOP! Turn over the page to Test 1 again. In the upper right hand corner, where it says 'Group No. —,' put the number 101" (or 102, 103, etc., according to the number of this group in the examiner's series of groups).

Have all examination booklets and pencils collected immediately and before the men are allowed to leave their seats. Before dismissing the group, the number of booklets collected should be carefully checked with the number of men present and the number of booklets issued.

2. DIRECTIONS FOR SCORING

General Rules

1. Each item is scored either right or wrong. No part credits are given.

2. In general, items evidently corrected stand as corrected.

3. In tests where the score is "Number Right," only wrong items need be checked in scoring. In Tests 4 and 5, where the score is "Right minus Wrong," wrong and omitted items must be separately checked.

4. Indicate the last item attempted by drawing a long line under that item and out into the margin.

5. *Enter the score* for each test in lower right-hand corner of

the test page and encircle it. When the test has been re-scored, a check mark may be made beside the circle.

6. Red or blue pencil increases accuracy of scoring.

Test 1

(Score is number right.)

1. No credit is given for any item in which *more* is done than the instructions require.

2. In an item where something is to be written "*in*" a given space, give credit if a mark crosses a line from haste or awkwardness; give no credit if the position is really ambiguous.

3. Where something is to be underlined or crossed out, give credit if two or three underlinings are made in the required place, and give credit for any method of crossing out.

4. *Item 2.*—The pencil line must begin and end either on the circumference or within the circles indicated. It may touch the intermediate circles, but must not cut through them.

5. *Item 6.*—In the circle marked "not 12" there must be some number which is not 12, such as 5, 0, 27.

6. *Item 9.*—The proper numbers must be crossed out to receive credit.

7. *Item 10.*—In Form 5, "2" alone and "3" alone, but not "2 or 3," in each of the two largest parts; "5" alone and "6" alone, but not "5 or 6," in the next to the smallest part, are correct. Similarly for other forms.

8. *Item 11.*—The lines must cross, or at least touch, the proper numbers; they may or may not cut the accompanying letters. Mere indication of the square, triangle, etc., is not sufficient.

9. *Item 12.*—Underlining in place of crossing out is wrong.

Test 2

(Score is number right.)

1. Answer may be written on dotted line or elsewhere near its problem.

2. If two answers are given to any problem, count as wrong.

3. If it seems clear that, by a slip, one answer has been put in the wrong brackets, and the next answers are all thus misplaced, give credit for the answers that are right even if misplaced.

4. Omission of dollar sign is permissible.

5. Omission of decimal point is permissible in items 2, 9, 13, and 14. Fraction may be expressed as decimal in item 15.

Test 3

(Score is number right.)

1. Any clear method of indicating answer is given full credit—underlining, checking, etc.

2. If two answers are marked, count as wrong unless one is clearly indicated as final.

Test 4

(Score is number right minus number wrong.)

1. Any clear method of indicating answer is given credit.

2. When both "Same and "Opposite" are underlined, counts as *omitted*, not as wrong.

3. If only "Same" is underlined right down the column, score for the test is zero. Similarly if "Opposite" is underlined right down the column.

Test 5

(Score is number right minus number wrong.)

Same rules as for Test 4.

Test 6

(Score is number right.)

1. If only one number is written, give no credit.

2. If only one of the numbers is right, give no credit.

3. If four numbers are written, as frequently happens with certain items (i. e., 33, 11 instead of 3, 3), give full credit.

Test 7

(Score is number right.)

1. Any clear indication other than underlining receives full credit.
2. Underlining of any of the first three words of an item does not remove credit.
3. If two or more of the last four words are marked, give no credit.

Test 8

(Score is number right.)

Same rules as for Test 7.

KEYS TO TESTS

The following keys for the several tests of the alpha examination which demand them are additions to the Examiner's Guide. Keys were not printed during the war either in the "Guide" or elsewhere.

KEY FOR ALPHA, TEST 2

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	37	46	58	65	29
2	$28.00	$30.00	$35.00	$27.00	$36.00
3	3	4	5	6	8
4	9	8	7	6	6
5	2	3	5	6	4
6	11	12	13	14	16
7	20	16	12	24	40
8	7	6	4	9	8
9	$1.21	$1.29	$1.31	$1.19	$1.11
10	36	32	28	24	40
11	5	4	10	8	6
12	8	12	6	4	10
13	$2.40	$1.60	$.80	$1.60	$3.20
14	$33.00	$36.00	$20.00	$26.00	$21.00
15	$2\frac{1}{2}$	$4\frac{1}{2}$	$2\frac{2}{3}$	$3\frac{1}{2}$	$1\frac{1}{2}$
16	6	12	9	15	18
17	9	8	6	8	12
18	17	19	18	27	28
19	300	200	400	500	600
20	3,463	3,213	3,409	3,895	3,607

KEY FOR ALPHA, TEST 3

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	*1	1	1	1	2
2	2	2	2	2	2
3	2	1	2	3	3
4	1	3	3	2	1
5	3	1	3	2	2
6	3	2	1	3	1
7	1	3	2	1	2
8	2	2	1	3	3
9	2	3	1	1	3
10	1	1	3	2	2
11	3	2	2	2	2
12	1	3	3	1	1
13	2	1	1	3	2
14	3	2	2	3	2
15	3	2	3	1	1
16	2	3	2	3	3

* The numbers indicated mean the order of the correct sentence in each case

KEY FOR ALPHA, TEST 4

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	opposite	opposite	opposite	opposite	opposite
2	opposite	opposite	opposite	opposite	opposite
3	opposite	same	same	same	same
4	same	same	opposite	same	opposite
5	opposite	opposite	same	opposite	same
6	same	same	same	same	same
7	opposite	opposite	opposite	opposite	opposite
8	same	same	same	same	opposite
9	same	opposite	same	same	same
10	same	same	same	opposite	opposite

KEY FOR ALPHA, TEST 4—*Continued*

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
11	same	same	opposite	opposite	same
12	opposite	same	opposite	opposite	same
13	opposite	opposite	same	opposite	same
14	opposite	opposite	opposite	same	opposite
15	opposite	same	same	opposite	same
16	same	same	same	opposite	opposite
17	same	same	opposite	same	same
18	same	opposite	same	same	same
19	opposite	opposite	opposite	opposite	same
20	opposite	opposite	opposite	same	opposite
21	same	same	same	opposite	same
22	same	opposite	opposite	same	same
23	same	same	same	opposite	opposite
24	same	same	opposite	same	same
25	same	opposite	opposite	same	same
26	opposite	same	same	same	opposite
27	opposite	opposite	opposite	opposite	same
28	same	same	same	same	opposite
29	opposite	same	same	opposite	opposite
30	same	opposite	opposite	opposite	same
31	opposite	same	same	opposite	opposite
32	same	same	same	same	same
33	same	same	opposite	opposite	same
34	same	opposite	opposite	same	opposite
35	same	same	same	same	opposite
36	same	opposite	same	opposite	same
37	opposite	opposite	same	same	same
38	same	same	opposite	same	same
39	same	same	opposite	same	opposite
40	same	same	same	same	opposite

Key FOR ALPHA, TEST 5

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	true	true	true	true	true
2	true	true	true	true	true
3	false	false	false	false	false
4	false	true	false	true	false
5	false	true	false	true	false
6	false	false	true	false	false
7	true	false	false	true	true
8	false	false	false	false	true
9	false	true	true	true	true
10	true	true	true	false	false
11	false	false	true	true	true
12	false	false	false	true	false
13	true	true	false	true	false
14	true	true	true	false	false
15	true	false	true	false	true
16	false	false	false	false	true
17	true	true	true	false	false
18	false	false	true	true	true
19	true	true	false	false	false
20	false	false	true	true	false
21	false	true	false	true	false
22	true	false	true	false	true
23	true	false	true	false	false
24	true	true	false	true	true

KEY FOR ALPHA, TEST 6

Form 5		*Form 6*		*Form 7*		*Form 8*		*Form 9*	
9	10	8	9	8	9	9	10	8	9
40	45	35	40	4	3	2	1	40	45
2	1	4	3	35	40	40	45	2	1
21	24	24	27	2	2	3	3	24	27
29	33	2	2	24	27	21	24	29	33
2	1	27	31	3	1	2	1	2	1
15	5	3	1	27	31	29	33	13	13
64	128	13	13	16	17	20	21	64	128
20	21	16	17	13	13	15	15	16	17
3	3	6	3	64	128	64	128	2	2
4	1	64	128	6	3	4	1	4	1
23	30	24	31	15	17	14	16	24	31
14	16	15	17	24	31	23	30	15	17
8	1	16	15	13	9	15	11	8	1
15	11	13	9	16	15	8	1	15	11
$1/9$	$1/27$	$1/4$	$1/8$	$1/4$	$1/8$	8	5	$1/4$	$1/8$
8	5	12	19	49	64	$1/9$	$1/27$	12	19
13	20	49	64	9	6	49	64	49	64
49	64	9	6	12	19	13	20	9	6
38	76	46	92	46	92	38	76	38	76

KEY FOR ALPHA, TEST 7

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	cuts	mew	barks	head	foot
2	see	cow	water	sheep	bed
3	bird	kitten	daughter	winter	boy
4	door	floor	dog	good	Thanksgiving
5	head	yard	auto	foot	bottom
6	eat	man	enemy	bird	meat
7	automobile	bad	collar	nose	speech
8	thin	sheep	army	bark	man
9	nest	head	shoe	wolf	vinegar
10	*buy*	*dangerous*	coat	short	good

KEY FOR ALPHA, TEST 7—*Continued*

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
11	ocean	shoe	sweet	small	America
12	second	wood	tame	month	little
13	leave	east	carriage	summer	horse
14	July	sky	west	dark	mouse
15	retreat	steam	sink	enemy	obey
16	bottom	finger	man	plant	net
17	plant	Saturday	bird	house	steam
18	herbivorous	coin	floor	enemy	niece
19	army	tree	engine	peasant	body
20	hear	small	wheel	breeze	cloudburst
21	sadness	top	life	second	flowers
22	sadness	limb	China	obey	dark
23	repel	money	earth	common	costly
24	parent	boys	second	negative	disagreeable
25	general	country	queen	week	army
26	end	shallow	weak	room	blame
27	first	bee	divide	horse	hive
28	small	auto	today	table	grief
29	end	cow	harvest	bicycle	d
30	bright	water	stubborn	books	sound
31	friend	enemies	honey	Chinese	easy
32	dull	criminal	silence	whole	discordant
33	warm	joy	early	enemies	rascal
34	bird	negative	torrid	leave	love
35	books	end	sadness	costly	sphere
36	pleasure	war	sorrow	loud	idiot
37	bricks	poverty	trivial	traitor	temperature
38	sun	10,000	originate	distracting	memory
39	joy	originate	compulsion	sculptor	depression
40	steam	fiction	year	exhilaration	bright

KEY FOR ALPHA, TEST 8

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
1	Columbus	Massachusetts	tobacco	tree	baseball
2	cards	cards	cards	cards	cards
3	automobiles	horse	sheep	horse	cow
4	fowl	brewing	flour	fishing	packing
5	West Point	blue	red	blue	yellow
6	Swift & Co.	fowl	fowl	fowl	fowl
7	comic artist	newspaper man	author	baseball player	writer
8	cow	W. L. Douglas	B. T. Babbitt	Smith & Wesson	Kuppenheimer
9	movie actress	movie actress	writer	temperance agitator	suffragist
10	cleanser	tobacco	flour	drink	chewing gum
11	vegetable	corn	hay	vegetable	hay
12	reefs	vegetable	vegetable	vegetable	vegetable
13	painter	New Haven	Cambridge	Ithaca	Annapolis
14	fish	Japan	India	Argentina	Brazil
15	green	mines	oysters	elephants	mines
16	corn	sculptor	composer	poet	painter
17	food product	reptile	bird	animal	reptile
18	tobacco	neck	neck	heel	shoulder
19	tree	disinfectant	patent medicine	food product	food product
20	India	battleship	battleship	tree	tree

KEY FOR ALPHA, TEST 8—*Continued*

	Form 5	*Form 6*	*Form 7*	*Form 8*	*Form 9*
21	phonograph	sword	cannon	sword	musket
22	abdomen	typewriter	adding machine	copying machine	copying machine
23	fabric	color	color	color	color
24	law	music	music	music	music
25	1,863	fabric	fabric	fabric	fabric
26	music	Hawthorne	Kipling	Mark Twain	Stevenson
27	trees	religion	lawyer	science	law
28	two	ignition	Franklin	carburetor	cylinder
29	sword	trees	6	Superbas	fruit
30	Stearns	science	science	science	science
31	Poe	Henry IV	The Merchant of Venice	Vanity Fair	The Old Curiosity [Shop
32	bowling	two	two	two	two
33	hexagon	law	law	law	law
34	shorthand	farming	farming	farming	farming
35	electricity	golf	tennis	football	hockey
36	Toledo	1775	1898	1865	Manila Bay
37	color	electricity	electricity	electricity	electricity
38	farming	Flint	England	Buffalo	Detroit
39	mineral	Bulgaria	liver	Wagram	mercury
40	The Christmas Carol	octagon	pentagon	trapezium	equilateral

3. TOTAL SCORE AND RATING

The result of examination alpha is expressed in a total sc which is the sum of the raw scores of the several tests. T raw scores are obtained as follows:

Test	*Method of scoring*	*Maximum raw score*
1	R	12
2	R	20
3	R	16
4	R–W	40
5	R–W	24
6	R	20
7	R	40
8	R	40
Total		212

Letter ratings are assigned on examination alpha as follows:

Rating	*Score*
A	135–212
B	105–134
C+	75–104
C	45– 74
C−	25– 44
D	15– 24
D−*	0– 14

* Recalled for further examination.

All ratings above D− are entered and reported at or Men whose scores are below D are recalled for examinat

beta. Ratings of D− may not be given in alpha, unless recall of the men for beta is impossible.

IV.—GROUP EXAMINATION BETA

1. DIRECTIONS FOR SETTING UP APPARATUS

Beta materials are shipped in three packages.

1. Blackboard frame.
2. Blackboard chart.
3. (*a*) Cardboard pieces for Test 7; (*b*) patterns for constructing cubes for Test 2.

The *blackboard frame* consists of 8 fitted sections, 2 uprights which carry 2 rollers and 4 crossbars which are attached to the small crosspieces of the uprights. The blackboard should be set up so that the ends of the rollers to which the crank may be fitted come on the right-hand side. A piece of beaver board 30 by 40 inches should be nailed to the crossbars so as to give a rigid writing surface. This must be procured in the camps.

The *blackboard chart* is a continuous roll 27 feet long. Care should be used in attaching chart to rollers so that it will wind evenly. The chart must be kept as clean as possible at all times. The painting should be gone over from time to time with a white gloss paint.*

The *patterns for constructing cubes for test 2* should be drawn on heavy cardboard on a scale such that the constructed model will appear to be made from 3-inch cubes. All cube edges, either real or imaginary, should be bordered in lines 1/8-inch thick painted with india ink. The models should be cut on the full lines and folded on the dotted lines as indicated in the patterns furnished. For these cube models a sloping shelf should be so arranged that the perspective from the center of the room will be the same as that of the models represented on the blackboard.

* The demonstration figures for beta are reproduced in Chapter VI, page 284 of this book.

Chalk, eraser, pointer, and a curtain for covering beta apparatus are also necessary.

2. PROCEDURE

It is most important that examination beta be given in a genial manner. The subjects who take this examination sometimes sulk and refuse to work. E. and his assistants will find it necessary to fill out most of the headings for the men before the examination begins. The time required for this preparatory work may be used to advantage in making the men feel at ease. As the demonstration preparatory to each test requires some time, the "pencils up" command is omitted in examination beta. The examiner's platform should be so high that he can readily see whether or not the subjects are working. Great care should be taken to prevent the over-anxious from beginning work before the command "Go."

Seating conditions should be such that subjects cannot copy from one another and the rule that copying shall not be allowed should be enforced strictly. The blackboard should at all times be kept clean so that the visual conditions may be excellent and constant. The blackboard figures for Test 1 should be exposed when the subjects enter the examining room. **As soon as a test has been demonstrated and the men have been told to go ahead, the blackboard should be covered and kept covered until time is called.** It should not be turned to the next test until the men have been ordered to stop work on a given test. Care should be taken to have the physical conditions of examination reasonably uniform.

With the exception of the brief introductory statements and a few orders, instructions are to be given throughout by means of gestures instead of words. These gestures accompany the samples and demonstrations and should be animated and emphatic.

It is absolutely necessary that directions be followed closely *and procedure kept* uniform and definite. Variations of pro-

cedure are more likely to occur in beta than in alpha, and there is serious risk that if allowed they will lessen the value of results. E. should especially guard against using more or fewer gestures or words for one group than for another. Oral language should be rigidly limited to the words and phrases given in the procedure for the different tests.

Whether the men get the idea of the test and enter into it with the proper spirit will depend chiefly on the skill with which the examiner, the demonstrator, and the orderlies carry out their respective parts. Examiner and demonstrator especially should be selected with the greatest care. An examiner who succeeds admirably in giving alpha may prove to be entirely unadapted for beta. Both examiner and demonstrator must be adept in the use of gesture language. In the selection of a demonstrator the Personnel Office should be consulted. One camp has had great success with a "window seller" as demonstrator. Actors should also be considered for the work. The orderlies should be able to keep the subjects at work without antagonizing them and to keep them encouraged without actually helping them.

The demonstrator should have the single task of doing before the group just what the group is later to do with the examination blanks. The blackboard is his beta blank. Before examination beta can be given satisfactorily the demonstrator must be letter perfect in his part. Both E. and demonstrator must be very careful to stand at the side of the blackboard in order not to hide the drawings.

As soon as the men of a group have been properly seated, pencils should be distributed and also examination blanks with Test 8 up.[1] While this is being done E. should say "Here are some papers. You must not open them or turn them over until you are told to." Holding up beta blank, E. continues:

"In the place where it says name, write your name; print it if you can. (Pause.) Fill out the rest of the blank about your

[1] *Test 8, although printed* on the record blanks, was not used.

age, schooling, etc., as well as you can. If you have any trouble we will help you." (The instructions given under segregation may be used for filling out the beta blank.) E. should announce the group number and see that it as well as the other necessary information is supplied. Before the examination proceeds each paper should be inspected in order to make sure that it is satisfactorily completed.

After the initial information has been obtained, E. makes the following introductory remarks:

"*Attention!* Watch *this* man (pointing to demonstrator). *He* (pointing to demonstrator again) is going to do *here* (tapping blackboard with pointer), what *you* (pointing to different members of group) are to do on your *papers* (here E. points to several papers that lie before men in the group, picks up one, holds it next to the blackboard, returns the paper, points to demonstrator and the blackboard in succession, then to the men and their papers). Ask *no questions*. *Wait* till I say 'Go ahead!'"

In general, when instructing the group to turn from test to test, E. holds up a beta blank before group and follows his own instructions as he gives them. As soon as he has turned to desired test or page he says, "This is test X *here;* look!" (pointing to the page).

To suggest to the group the necessity of working rapidly the demonstrator, after proceeding very deliberately with the early samples of each test, hurries, as soon as he has worked out the last sample problem

(1) to record his response as fast as he can,
(2) then to catch E.'s eyes for approval and
(3) finally, to slip away from blackboard, drawing curtain as he does so.

After the personal data called for on page 1 of blank have been gathered and recorded, the orderlies' vocabulary in beta is rigidly restricted to the following words, or their literal equivalents in Italian, Russian, etc.: *Yes, No, Sure, Good, Quick,*

How many? Same, Fix it. Under no circumstances may substitutional explanations or directions be given.

Test 1.—Maze

"Now turn your papers over. This is Test 1 *here* (pointing to page of record blank). Look." After all have found the page, E. continues, "Don't make any marks till I say 'Go ahead.' Now *watch.*" After touching both arrows, E. traces through first maze with pointer and then motions the demonstrator to go ahead. Demonstrator traces path through first maze *with crayon*, slowly and hesitatingly. E. then traces second maze and motions to demonstrator to go ahead. Demonstrator makes one mistake by going into the blind alley at upper left-hand corner of maze. E. apparently does not notice what demonstrator is doing until he crosses line at end of alley; then E. shakes his head vigorously, says "No—no," takes demonstrator's hand and traces back to the place where he may start right again. Demonstrator traces rest of maze so as to indicate an attempt at haste, hesitating only at ambiguous points. E. says "Good." Then, holding up blank, "Look here," and draws an imaginary line across the page from left to right for every maze on the page. Then, "All right. Go ahead. Do it (pointing to men and then to books). Hurry up." The idea of working fast must be impressed on the men during the maze test. E. and orderlies walk around the room, motioning to men who are not working, and saying, "Do it, do it, hurry up, quick." **At the end of 2 minutes** E. says, "Stop! Turn over the page to Test 2."

Test 2.—Cube Analysis

"This is Test 2 *here.* Look." After every one has found the page—"Now watch." The order of procedure is as follows:

(1) E. points to the three-cube model on the blackboard, making a rotary movement of the pointer to embrace the entire picture.

(2) With similar motion he points to the three-cube model on shelf.

(3) E. points next to picture on blackboard and asks, "How much?"

(4) E. turns to cube model and counts aloud, putting up his fingers while so doing, and encouraging the men to count with him.

(5) E. taps each cube on the blackboard and motions to demonstrator asking him "How much?"

(6) Demonstrator (pointing) counts cubes on blackboard silently and writes the figure 3 in proper place.

In the second sample of this test, when E. counts cubes of model he

(1) counts the three exposed cubes;
(2) touches the unexposed cube with pointer; and
(3) without removing pointer turns model, so that hidden cube comes into view of group. In other respects procedure with second and third samples is the same as with first.

In counting the 12-cube model, E. (1) counts the top row of cubes in the model (left to right), (2) counts the exposed bottom row (right to left), (3) taps with pointer the end cube of hidden row, (4) turns the entire model around and completes his counting. E. then holds model in same plane as drawing and counts (in the same order as above) the cubes on blackboard, counting lines between front and top row as representing the hidden row. He then asks demonstrator "How much?" Demonstrator counts the cubes on blackboard (pointing but not speaking) and writes the response.

Throughout the demonstration the counting is done deliberately, not more rapidly than one cube per second.

At end of demonstration E. points to page and says, "All right. Go ahead." **At the end of $2^1/_2$ minutes** he says, "Stop! look at me and don't turn the page."

Test 3.—X–O Series

"This is Test 3 *here.* Look." After everyone has found the page—"Now watch." E. first points to the blank rectangles at the end, then traces each "O" in chart, then traces outline of "O's" in remaining spaces. Demonstrator, at a gesture, draws them in. E. then traces first "X" in next sample, moves to next "X" by tracing the arc of an imaginary semicircle joining the two, and in the same manner traces each "X," moving over an arc to the next. He then traces outlines of "X's" in the proper blank spaces, moving over the imaginary arc in each case, and motions to demonstrator to draw them in. Demonstrator, at a gesture, fills in remaining problems very slowly, standing well to the right of the blackboard and writing with his left hand. E. points to page and says, "All right. Go ahead. Hurry up!" **At end of $1\frac{3}{4}$ minutes** he says, "Stop! Turn over the page to Test 4."

Test 4.—Digit-Symbol

"This is Test 4 *here.* Look." After every one has found the page—"Now watch." E. points to first digit of key on blackboard and then points to the symbol under it. Same for all nine digits in key. E. then (1) points to first digit of sample, (2) to the empty space below digit, (3) points to corresponding digit of key, (4) points to proper symbol under digit in key, and (5) traces the outline of the proper symbol in the blank space under the digit in the sample. Same for first five samples. Demonstrator, at a gesture, fills in all the samples, working as follows: (1) Touches the number in first sample with index finger of right hand; (2) holding finger there, finds with index finger of left hand the corresponding number in key; (3) drops index finger of left hand to symbol for number found; (4) holding left hand in this position writes appropriate symbol in the lower half of sample.

Similarly with the other samples. While working, demon-

strator should stand as far as possible to the left, doing all the samples from this side.

At the end of demonstration E. says, "Look, here" and points to key on page, repeating the gestures used in pointing on the blackboard at the beginning of the demonstration. Then, "All right. Go ahead. Hurry up!" Orderlies point out key to men who are at a loss to find it. **At the end of 2 minutes,** E. says, "Stop! But don't turn the page."

Test 5.—Number Checking

"This is Test 5 *here.* Look." After every one has found the page. "Now watch." In this demonstration E. must try to get "Yes" or "No" responses from the group. If the wrong response is volunteered by group, E. points to digits again and gives right response, "Yes" or "No" as the case may be. E. points to first digit of first number in left column, then to first digit first number in right column, then to second digit first number in left column and second digit first number in right column, nods head, says "Yes" and makes an imaginary cross at end of number in right column. Motions to demonstrator, who makes an "X" there. E. does the same for second line of figures, but here he indicates clearly by shaking head and saying "No" that certain digits are not identical. E. repeats for three more sets and after each, looks at group, says "Yes?" in questioning tone and waits for them to say "Yes" or "No." He repeats correct reply with satisfaction. Demonstrator checks each after group has responded, or at signal from E. if group does not respond. Demonstrator then works out remaining items, pointing from column to column and working deliberately. E. summarizes demonstrator's work by pointing to the whole numbers in each set and saying "Yes" (indicating X) or "No;" if "No," he shows again where the numbers are unlike. E. then points to page and says "All right. Go ahead. Hurry up!" **At the end of 3 minutes,** E. says "Stop. Turn over the page to Test 6."

Test 6.—Pictorial Completion

"This is Test 6 *here*. Look. A lot of pictures." After every one has found the page, "Now watch." E. points to hand and says to demonstrator, "Fix it." Demonstrator does nothing, but looks puzzled. E. points to the picture of the hand, then to the place where finger is missing and says to demonstrator, "Fix it; Fix it." Demonstrator then draws in finger. E. says, "That's right." E. then points to fish and place for eye and says, "Fix it." After demonstrator has drawn missing eye. E. points to each of the four remaining drawings and says, "Fix them all." Demonstrator works samples out slowly and with apparent effort. When the samples are finished E. says, "All right. Go ahead. Hurry up!" During the course of this test the orderlies walk around the room and locate individuals who are doing nothing, point to their pages, and say, "Fix it. Fix them," trying to set everyone working. **At end of 3 minutes,** E. says, "Stop! But don't turn over the page."

Test 7.—Geometrical Construction

"This is Test 7 *here*. Look." After every one has found the page, "Now watch." Examiner points to the first figure on blackboard. He then takes the two pieces of cardboard, fits them on to the similar drawings on blackboard to show that they correspond and puts them together in the square on blackboard to show that they fill it. Then, after running his finger over the line of intersection of the parts, E. removes the pieces and signals demonstrator, who draws solution in the square on blackboard. The same procedure is repeated for the second and third sample. Demonstrator works out fourth sample, after much study, pointing from the square to the forms.

Demonstrator first draws the two small squares in the upper half of the large square, then the two triangles in the remaining rectangle. Each small figure is drawn in by tracing its entire circumference, not merely the necessary dividing lines. While

drawing each small figure in the large square, demonstrator points with index finger of left hand to the corresponding small figure at left of square, taking care not to obstruct the view. At the end of demonstration E. holds up blank, points to each square on the page and says, "All right. Go ahead. Hurry up!" **At end of $2^1/_2$ minutes,** "Stop! Turn over the page." Papers are then collected immediately.

3. DIRECTIONS FOR SCORING

General Rules

1. In general, items evidently corrected stand as corrected. The only exception to this rule is in the maze test.

2. In tests where the score is number right, only wrong items need be checked in scoring. In Test 5, where the score is right minus wrong, wrong and omitted items must be separately checked.

3. Enter the score for each test in lower right-hand corner of the test page and encircle it. When the test has been rescored a check may be made beside the circle.

4. Red or blue pencil increases accuracy of scoring.

Test 1

1. One-half point for each correctly completed half of maze. A half maze is correct if drawn line does not cross any line of maze (except through awkwardness) nor an imaginary straight line across the opening of a wrong passage.

2. Allow much leeway in the cutting of corners.

3. Spur running into any blind passage counts wrong for that half-item, even though erased.

4. When two lines are drawn, one straight across the page, the other correct, full credit is given.

Test 2

Score is number right.

Test 3

1. Score is number right.
2. Any incomplete item receives no credit.
3. Count any item correct if intended plan is carried out. Disregard additional unnecessary marks, such as circles between the crosses of items 2 and 4 in first part of line, etc.

Test 4

1. Score is one-third of number of correct symbols.
2. Use leniency in judging form of symbol.
3. Credit symbol for 2 even though reversed.

Test 5

1. Score is right minus wrong (number of items checked that should be checked minus number of items checked that should not be checked).
2. If other clear indication is used instead of crosses, give credit.
3. If numbers which should not be checked are marked by some other sign than is used to check similar pairs, count as though not marked.
4. If all items are checked, the score for the test is zero.

Test 6

1. Score is number right.
2. Allow much awkwardness in drawing. Writing in name of missing part or any way of indicating it receives credit, if idea is clear.
3. Additional parts do not make item wrong, if proper missing part is also inserted.
4. Rules for individual items:

Item 4.—Any spoon at any angle *in right hand* receives credit. Left hand, or unattached spoon, no credit.

Item 5.—Chimney must be in right place. No credit for smoke.

Item 6.—Another ear on same side as first receives no credit.

Item 8.—Plain square, cross, etc., in proper location for stamp, receives credit.

Item 10.—Missing part is the rivet. Line of "ear" may be omitted.

Item 13.—Missing part is leg.

Item 15.—Ball should be drawn in hand of man. If represented in hand of woman, or in motion, no credit.

Item 16.—Single line indicating net receives credit.

Item 18.—Any representation intended for horn, pointing in any direction, receives credit.

Item 19.—Hand and powder puff must be put on proper side.

Item 20.—Diamond is the missing part. Failure to complete hilt on sword is not an error.

Test 7

1. Score is number right.
2. Allow considerable awkwardness in drawing.
3. Extra subdivisions, if not erased, make item wrong.
4. Rules for individual items:

Item 1.—Line of division may be slightly distant from true center, and need not be straight.

Item 3.—Lines of semi-circumference must start from or near corners of square.

Item 4.—Line must not start from corner.

4. TOTAL SCORE AND RATING

The result of examination beta is expressed as a "total score," hich is the sum of the raw scores of the several tests. The raw ores are obtained as follows:

Test	*Method of scoring*	*Maximum score*
1.....	Half point for each half maze....	5
2.....	Number right.....	16
3.....	Number right.....	12
4.....	One-third of number right.....	30
5.....	Right minus wrong.....	25
6.....	Number right.....	20
7.....	Number right.....	10
Total..	.....	118

Letter ratings are assigned on examination beta as follows:

Rating	*Scores*
A.....	100–118
B.....	90– 99
C+.....	80– 89
C.....	65– 79
C−.....	45– 64
D.....	20– 44
D−*.....	0– 19

* Recalled for individual examination.

All ratings above D− are entered and reported at once. len whose scores fall below D are recalled for individual ex- *nination.*

Ratings of D— may not be given in examination beta, unless recall of the men for individual examination is impossible.

V.—INDIVIDUAL EXAMINATIONS

1. GENERAL DIRECTIONS

Purpose.—The main purpose of the individual examination is to secure a more accurate measurement of the mental ability of those who have made D— in alpha or beta, or in both. By the personal contact it allows it should also yield valuable supplementary information of a kind which cannot be brought out by a group examination. All the kinds of information secured should be considered in connection with recommendation concerning a man.

The Subjects.—Men who are likely to be summoned for individual examination fall into three classes—*literates, illiterates,* and *non-English speaking.* Since the procedure of examination varies importantly with the class, the first task of the examiner is to assign the man who has reported for individual examination to his proper category. The following definitions will assist in the process of classifying:

Literates.—Those who have been allowed to take alpha may ordinarily be considered literate for purpose of individual examination. Subjects who have not taken alpha may be considered literate if they have completed the third grade (or its equivalent) in an American school. E. should question S. regarding his opportunities for schooling, and if necessary may test his ability to read and write English.

Illiterates are those who do not meet the above requirements, but who understand and speak English fairly well. The subject may be highly literate in some language but illiterate in English. Such are to be classed as illiterate for the present purpose.

Non-English-speaking subjects are those who, whether foreign

born or American born, are unable to understand or speak English sufficiently well to take an oral examination given in English. The majority of such subjects are foreigners, but many foreigners belong in either the literate or the illiterate class instead of in the non-English speaking.

Choice of Examination.—Literates should be examined by means of the point scale or the Stanford-Binet scale according to availability of materials and preference of the examiner. Usually it will not be necessary to give a literate subject further examination, but if the examiner is in doubt as to proper rating and recommendation concerning subject, he should, after completing examination by the one or the other of these scales, supplement his observations by giving such performance tests as seem desirable.

Illiterates should be examined by means of one or more of the following systematic procedures: (*a*) the point scale as adapted for illiterates: (*b*) the Stanford-Binet scale as adapted for illiterates; (*c*) the performance scale with oral instructions. In certain instances it may be obviously desirable or necessary to use the performance scale in addition to the one or the other adapted scale. As a rule it should be unnecessary to use other than either the point scale or Stanford-Binet (complete or adapted) in the case of a subject who has attended an American school as much as four or five years. Inability to read and write *after that amount of schooling* nearly always indicates grave mental inferiority, and should not be considered an excuse for failure on such tests as writing from dictation, counting backward, making change, etc. Those who are illiterate from complete lack of educational opportunity should be given the performance scale.

Non-English-speaking subjects can be examined safely only by means of the performance scale with non-verbal instructions. Those subjects who understand English slightly may profit by the use of such words as "no," "yes," etc. For this reason words may be used by the examiner to supplement his gestures,

but they must not be depended upon as a means of conveying the idea of what is to be done in a given test.

The duration and extent of an individual examination should depend upon the nature of the case and should vary with the information necessary for safe report and recommendation. In some instances only a few tests need be given, in others, even a prolonged examination may leave the examiner in doubt concerning suitable recommendation, and may force him to appeal to company commander or others for supplementary information. Unless conditions render haste imperative, the examiner should obtain a definite intelligence rating for each subject in terms of mental age.

Condensed instructions for administering the point scale and the Stanford-Binet scale are printed in this guide for the convenience of examiners, but these instructions can be used safely only on the basis of thorough knowledge of the detailed descriptions of these two scales which are available in book form. The performance scale is fully described in this guide, since its constituent parts and their standardization are newly chosen and especially adapted for army use.

It is the task of the psychological examiner to obtain reliable intelligence ratings and to make recommendations based thereupon. Where serious mental peculiarities or psychopathic conditions are discovered, full report should be made and the subject promptly referred to the psychiatrist with such information as the psychological examination has supplied.

The Examiner's Recommendations.—As a result of careful psychological examination, the examiner may conclude, (1) that the subject should be assigned or returned to appropriate military organization for regular training; (2) that he should be assigned or transferred to the Development Battalion or to a service organization in which simple forms of manual labor are the chief requirement; (3) that he should be recommended to the psychiatrist for discharge by reason of intellectual deficiency; (4) that he should be referred to the psychiatrist for further

examination because of peculiarities of behavior or definite psychopathic tendencies.

It is impossible to state with safety the particular degree of intellectual deficiency which justifies recommendation for discharge. Other factors than intelligence contribute to a man's serviceableness in the Army. These must be taken into account. If the officers who are attempting to train a man are satisfied with his responses, the indications are that he should not be discharged, even if very inferior in intelligence. *In general, subjects whose mental age is below eight should be seriously considered for discharge or Development Battalion. Those whose mental ages range from eight to ten should be considered for use in special service organizations or for assignment to Development Battalion.* All others, except those whose psychotic symptoms would cause their immediate reference to the neuro-psychiatric examiner, should be assigned to regular training organizations.

Grade E shall be given to all men who are recommended by the examiner for discharge, Development Battalion, or service organizations, *and to such men only.* All men whose intelligence is deemed satisfactory for regular military duty shall be given rating of D — or higher.

In this connection too great emphasis cannot be laid upon the use of common sense as well as technical skill and information by the psychological examiner. While doing his utmost to obtain reliable measurement of mental traits, he should be quick to observe indications of qualities of physique, temperament, and character which are important in the soldier.

2. POINT SCALE EXAMINATION

(a) PROCEDURE *

The directions for the Point Scale examination given on pp. 39–44 of the Examiner's Guide are omitted here because of copyright restrictions.

(b) ADAPTATION FOR USE WITH ILLITERATES

In the examination of an illiterate subject, tests 14 and 18 should be omitted and the following additions made to the total score:

Total score	*Points added*
18–51	0
52–58	2
59–62	4
63–69	6
70–74	8
75–77	9
78–90	10

(c) EXPRESSING AND INTERPRETING RESULTS

The results of the point-scale examination should be expressed in the following ways: (1) Total score; (2) mental age; (3) letter rating. The accompanying tables will enable the examiner readily to transmute any point-scale score into mental age and letter rating.

* The following condensed directions for point scale examination (omitted) should be supplemented by reference to Yerkes, Bridges and Hardwick, "A Point Scale for Measuring Mental Ability," Warwick and York, Baltimore.

TABLE OF EQUIVALENT POINT-SCALE VALUES

Score	*Mental age*	*Score*	*Mental age*
88 to 100	18 or above	51	9.1
		50	9
87	17.5	49	8.9
86	17	48	8.8
85	16.5	47	8.7
84	16.1	46	8.6
83	15.7	45	8.4
82	15.3	44	8.3
81	14.9	43	8.2
80	14.5	42	8.1
79	14.2	41	8.0
78	13.9	40	7.8
77	13.6	39	7.7
76	13.4	38	7.5
75	13.2	37	7.3
74	13	36	7.2
73	12.8	35	7.0
72	12.5	34	6.9
71	12.3	33	6.7
70	12	32	6.6
69	11.8	31	6.4
68	11.7	30	6.3
67	11.5	29	6.1
66	11.3	28	6.0
65	11.2	27	5.8
64	11.0	26	5.7
63	10.8	25	5.5
62	10.7	24	5.3
61	10.5	23	5.2
60	10.3	22	5.0
59	10.2	21	4.9
58	10	20	4.7
57	9.9	19	4.6
56	9.8	18	4.4
55	9.6	17	4.3
54	9.5	16	4.1
53	9.4	15	4.0
52	9.3		

Subjects obtaining a score of 60 points or more may ord be recommended for regular military training; subjects c ing scores from 40 to 59 points should be considered for a ment to service organizations or to Development Bat subjects with scores below 40 points should be consider discharge.

Letter ratings should be assigned as follows:

A	(Not given)
B	95–100
C+	90–94
C	80–89
C—	70–79
D	60–69
D—	0–59

(See below.)

Grade E shall be given to all men who are recommen the examiner for rejection, discharge, Development Bat or service organizations, *and to such men only.* All men intelligence is deemed satisfactory for regular military shall be given rating of D— or higher.

3. STANFORD-BINET EXAMINATION

(a) PROCEDURE *

The directions for the Stanford-Binet examination on p 66 of the Examiner's Guide are omitted here because of right restrictions.

(b) ADAPTATION FOR USE WITH ILLITERATES

In the examination of an illiterate subject only thos in each year-group which are starred in the record

* The following directions (omitted) for the Stanford-Binet exan should be supplemented by reference to Terman, "The Measure Intelligence," Houghton Mifflin Company, Boston.

should be given.[1] When only the starred tests are given, credits should be assigned in accordance with the following table:

Years 3 to 10.....	3	points (or months) per test.
Year 12.....	5	points (or months) per test.
Year 14.....	6	points (or months) per test.
Year 16.....	7½	points (or months) per test.
Year 18.....	9	points (or months) per test.

The probable error of a mental age score derived by the scale as thus abbreviated is approximately 7½ months, as contrasted with a probable error of less than 6 months for the unabbreviated scale as applied to unselected adults.

(c) EXPRESSING AND INTERPRETING RESULTS

As this is an age scale, the responses are ordinarily scored in terms of months. They may also be scored in terms of points by those who prefer this method. When this is done, each test is given a point value corresponding to its value in months. A subject is credited with the full number of points for each test below the year-group actually given, *and in addition with 24 points for years 1 and 2.* He is also credited with the actual number of points scored in the year-groups given. It is thus possible to score as high as 30 points (months) in year XVI and 36 in year XVIII, making a total possible score of 234 points, or a mental age of 19 years, 6 months. If fewer than the regular number of tests are used from a given year-group, each test should be assigned a proportionately higher point value. If more than the regular number are used, each test should be assigned a proportionately lower value. Where half credit is allowed for a response, half the number of points is given.

The results of Stanford-Binet examinations are to be expressed in the following ways: (1) Mental age in years and decimal of a year; (2) letter rating.

[1] This blank is reproduced in "Psychological examining in the United States Army." Memoirs of the National Academy of Sciences, vol. 15. (In press).

Mental ages correspond to the letter ratings as follows:

A	18. -19.5
B	16.5-17.9
C+	15. -16.4
C	13. -14.9
C−	11. -12.9
D	9.5-10.9
D−	Below 9.5

Subjects obtaining a score of 10 years (120 points) or m may ordinarily be recommended for regular military traini subjects between 8 and 10 years (96 to 119 points) should considered for assignment to service organization or Devel ment Battalion; subjects below 8 years (96 points) should considered for discharge.

Grade E should be given to all men who are recommen by the examiner for discharge, Development Battalion, service organization, *and to such men only.* All men whose telligence is deemed satisfactory for regular military duty s be given rating of D— or higher.

4. PERFORMANCE SCALE EXAMINATION

(a) PROCEDURE

Test 1.—The Ship Test

Materials.—A frame and ten pieces which, when prop fitted together, form a ship.

Directions.—E. shows S. the frame with the pieces prop fitted therein, and says: "*This is a picture of a ship. Look carefully.*" S. is allowed to look at the picture for 10 secor then E. withdraws the picture from view, removes the pie and presents the empty frame and the pieces arranged a Fig. 13 (1).*

* The figure numbers of the "Guide" appear in parenthesis.

he pieces may be numbered on the edge toward E. from left right to indicate their positions. The frame is next the sub-

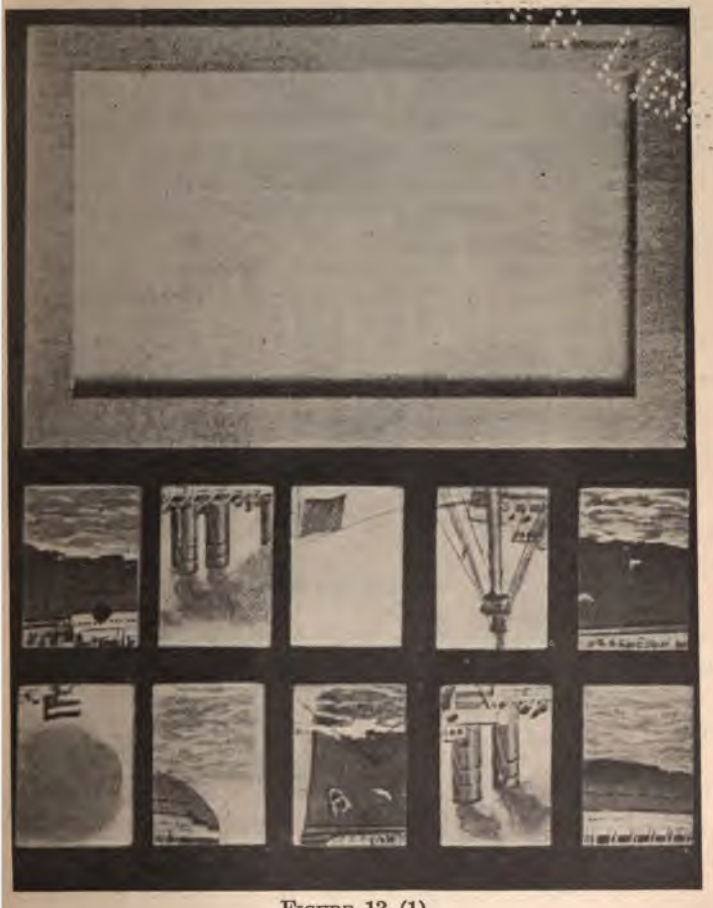


FIGURE 13 (1).

ect. E. says: "*Put these pieces in the frame as quickly as you an so as to make the ship you just saw.*"

S. is given *five minutes,* and is allowed to make any changes

he wishes within the time limit; but E. must not suggest the changes.

Scoring.—A score of one is allowed for each of the lower or upper pieces, if placed in the lower or upper portion of the frame, i. e., the "water" pieces at the bottom and the "sky" pieces at the top, except that no credit is given for an inverted piece. In addition to this, a score of one is given to each piece that is in its correct relative position in the upper or lower row. The maximum score for accuracy is thus 20 points.

If the score for accuracy is 18 or more, additional credit is given for time as follows:

Time	*Credit*
0–20	5
21–30	4
31–50	3
51–80	2
81–120	1
121–300	0

The maximum raw score is, therefore, 25 points.

Test 2.—Manikin and Feature Profile

Materials.—(*a*) Six pieces which when put together represent the conventional figure of a man.

(*b*) Eight pieces which when put together form the figure of a human head.

Directions.—(*a*) The pieces are placed before S., as in Fig. 14 (2). Each arm and each leg is placed at the opposite side of the body from the place where it fits. E. says, "*Put this together as quickly as you can.*"

(*b*) The pieces are placed before S., as in Fig. 14 (2). The three pieces forming the face are separated from each other by the four pieces forming the ear. E. says, "*Put this together as quickly as you can.*"

The time limit for (*a*) is *two minutes*, for (*b*) *five minutes*.

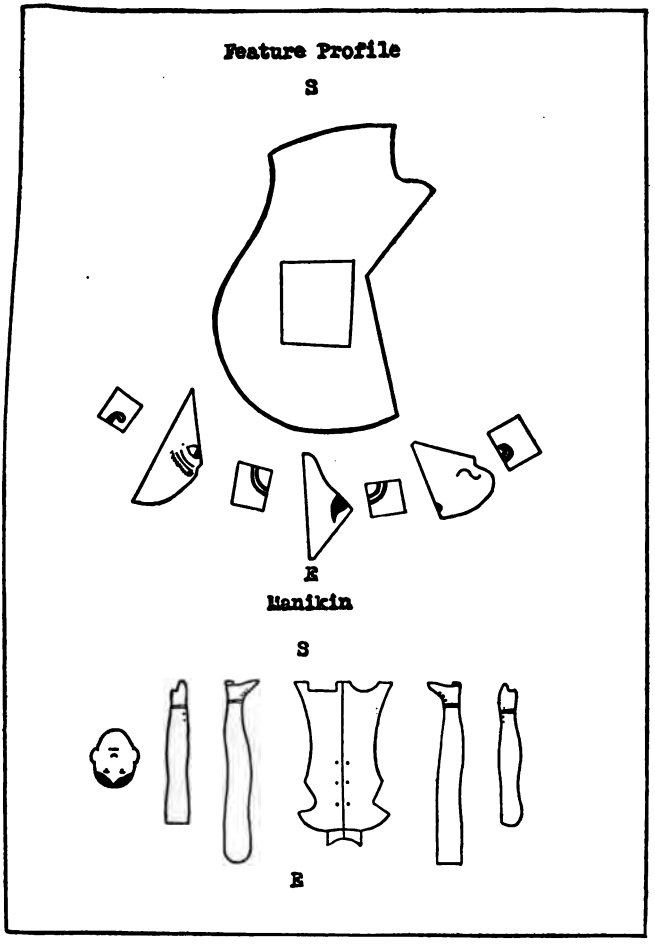


FIGURE 14 (2).

Spontaneous changes are allowed within the time limit. S. is not told what the pieces make. If S. scores 3 or less on (*a*), E. fits it together correctly and then goes on to (*b*). If the score on (*a*) is 0, (*b*) need not be given.

Scoring.—The end products are scored as follows:

	Points
(*a*) One point for each piece in correct position; i. e., for a perfect performance	5
One or both arms not exactly fitting joints	4
One reversal of arms *or* legs	3
Two reversals, arms and legs	2
Legs and arms interchanged, or any other result that looks like a man	1
Poorer than this, not resembling a man	0

(*b*) One point for each face piece in correct position, 1 point for a partly correct ear—i. e., one, two, or three pieces in the correct place—and 2 points for a completely correct ear, making a total for accuracy of 5 points.

Credit is given for time only if the score for accuracy is on (*a*) 4 or 5 points, on (*b*) 5 points. Then credit as follows:

Time (*a*)	*Time* (*b*)	*Credit*
0– 10	0– 30	5
11– 15	31– 40	4
16– 20	41– 60	3
21– 30	61– 80	2
31– 50	81–120	1
51–120	121–300	0

The maximum raw score is, therefore, 20 points on (*a*) and (*b*) together.

Test 3.—Cube Imitation

Materials.—(1) Four 1-inch cubes fastened 2 inches apart to a wooden base. Both cubes and base are painted a dark red. The cubes are numbered 1 to 4 from right to left. (2) A fifth

cube of the same size unattached and similarly painted. (3) Ten imitation problems (*a* to *j*), as printed on the record sheet.

Directions.—E. places the cube board before S., with the numbered side of the cubes directed away from him, and says: "*Watch carefully and then do just what I do.*" E. next with the fifth cube taps the attached blocks in a predetermined order, as, for example, in (*a*) 1—2—3—4, at the rate of *one per second.* He now lays the tapping cube down before S., midway between the second and third cubes, but nearer to S. than the cube board, and says: "*Do that.*" If in the first problem S. taps 4—3—2—1 instead of the reverse, E. credits the response and says: "*No, begin here*" (pointing to 1).

Parts (*b*) to (*j*) are given in order unless S. fails in 5 successive parts. In this event the test is discontinued. It is important that the rate of tapping should not be faster than one per second.

Scoring.—The responses are recorded as right (+) or wrong (—); and 1 point is given for each success. The maximum raw score is 10 points.

Test 4.—Cube Construction

Materials.—(1) A block of wood (model 1) 1 by 3 by 3 inches, painted a dark red on the four sides, not on the upper or lower surfaces, and cut to a depth of 2 mm., so that it closely resembles a composite of 9 small cubes. (2) Nine 1-inch cubes necessary for the construction of model 1, four painted on two sides, four painted on one side, and one not painted. (3) A block of wood (model 2), same size as model 1 but painted on the top as well as the four sides. (4) Nine 1-inch cubes necessary for construction of model 2. (5) A 2-inch cube (model 3), unpainted and cut on the six surfaces so that it looks like a composite of eight small cubes. (6) Eight 1-inch cubes painted on three sides for the construction of model 3.

Directions.—E. presents model 1, and says: "*You see this block. Notice that it is painted on the sides but not on the top or*

the bottom; and you see these smaller blocks [E. presents blocks described under (2), above] *partly painted and partly unpainted. These nine blocks can be put together so as to make one just like this.*" E. puts the blocks together, pointing to the painted surface or surfaces of each cube as he fits it in position.

(*a*) E. then presents the *same model* and blocks in irregular order, and says: "*Now, you fit the blocks together so as to make one like this.*"

(*b*) E. now presents model 2 and the blocks for its construction and says: "*Now, put these blocks together so as to make one just like this. Notice that it is painted on the edges and on the top but not on the bottom.*"

(*c*) E. presents model 3 and says: "*You see this block; notice that it is not painted anywhere; and you see these smaller blocks* [present blocks described under (6) above] *that have three sides painted and three not painted. Now, I want you to fit these eight blocks together so as to make one just like this. Remember, it is not painted on the bottom, top, or sides.*"

With a stop watch E. takes time in seconds for assembling the cubes. He also counts the number of moves. A move is to be understood as *a placement in some position designed to complete the structure.* If parts of a structure are assembled separately, putting such parts together does not count an additional move. If the blocks are fitted together in the hand, the moves are counted just as they are if assembled on the table. Turning a block over or otherwise shifting its position in the structure is counted a move, but turning it over in the fingers, picking it up, and placing it upon the table are not to be counted moves. S. is penalized sufficiently for such behavior by the longer time.

Time for work on each part, *two minutes.* If S. assembles blocks before time is up, allow spontaneous corrections, counting extra time and additional moves. Each block changed counts one move as before. The time should be taken when S. indicates verbally *or otherwise* that he has finished.

Scoring.—No credit is to be given for time, if the blocks are not all assembled; but if they are, credit as follows:

(*a*) *Seconds*	(*b*) *and* (*c*) *Seconds*	*Credit*
1– 10	1– 20	5
11– 25	21– 30	4
26– 50	31– 50	3
51– 80	51– 80	2
81–120	81–120	1

No matter whether S. has finished or not, count each misplaced block as three additional moves and each unassembled block as six additional moves, and credit total moves as follows:

(*a*) *and* (*b*) *Moves*	(*c*) *Moves*	*Credit*
9	8	5
10–11	9–10	4
12–15	11–15	3
16–25	16–25	2
26–50	26–50	1

Note that the minimum number of moves is nine for (*a*) and (*b*), and eight for (*c*); that no credit is given for over 50 moves; and that the maximum raw score is 10 points for each part, or a total of 30.

Test 5.—Form Board

Materials.—See illustration of problems, Fig. 15 (3), for identification of the materials.

Directions.—E. places the board before S., arranged as shown in "demonstration." "E." and "S." in this figure indicate the relative positions of examiner and subject. E. says: "*These blocks can be changed around so as to make room for this extra square, like this.*" E. proceeds to solve the problem in the minimum number of moves, making sure that S. is attending.

(*a*) E. now presents the board arranged for problem A, saying: "*Without making any more moves than you have to, change these blocks around so you can find a place for the extra square* (pointing to square). *Don't have any blocks left over. Ready—go ahead.*"

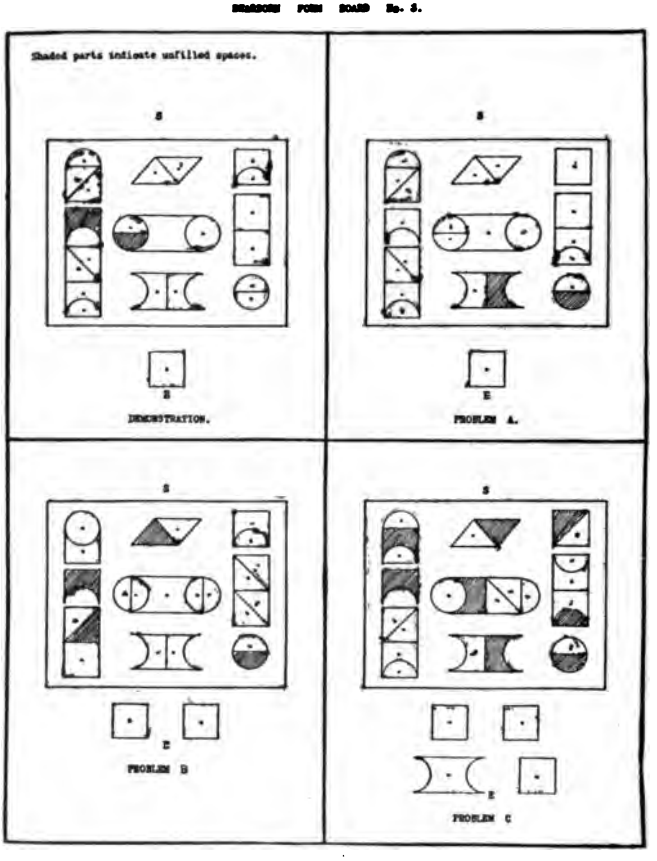


FIGURE 15 (3).

(*b*) E. now presents the board arranged for problem B, say

ing: "*I want you to change these blocks around so you can find places for these two extra squares* (pointing to them). *Ready—go ahead.*"

(*c*) E. presents the board arranged for problem C, saying: "*Now I want you to change the blocks around so you can find places for these four extra blocks. Ready—go ahead.*"

E. records the time in seconds from start to finish, and counts the number of moves. *A move is to be understood as placing or trying to place a block in some position on the board.* Taking a block out of position, and placing a block upon the table are not counted as moves.

Time for work on (*a*) and (*b*), *two minutes each;* on (*c*), *three minutes.* If (*a*) is not solved in the time allowed, E. demonstrates that correct solution before going on to (*b*).

Scoring.—If a problem is not solved within the time limit, score that part 0; but *if a correct solution has been accomplished,* give credit for time and for moves as follows:

MOVES				TIME		
(*a*)	(*b*)	(*c*)	*Credit*	(*a*) *and* (*b*)	(*c*)	*Credit*
·· - -	....	8	5	0– 10	0– 20	5
·· - -	....	9	4	11– 20	21– 40	4
3	5	10–11	3	21– 40	41– 70	3
4	6	12–14	2	41– 70	71–110	2
5—7	7–10	15–20	1	71–120	111–180	1

Note that the minimum number of moves for problems (*a*), (*b*), and (*c*) is 3, 5, and 8, respectively, and that the maximum raw scores are 8, 8, and 10, or a total of 26 points.

The examiner will find it advantageous to make a diagram of the arrangement of the blocks for each problem, as in Fig. 15 (3), and paste it on the screen between him and the subject. He can then copy the pattern on the board out of view of the subject, and with a little practice, can do it very expeditiously—often in less than 30 seconds.

Test 6.—Designs

Materials.—The five plates of designs on pp. 143 to 152. E. provides S. with pencil and paper.

Directions.—The designs are given in order, (*a*), (*b*), (*c*), (*d*). Formula for (*a*) and (*b*): "*I am going to show you a drawing. You will have just ten seconds to look at it; then I shall take it away and let you draw it from memory. Don't begin to draw till I say 'go.'*"

Formula for (*c*) and (*d*): "*This time I shall show you two drawings. You will have only ten seconds to look at them, then I shall take them away and you are to draw them both from memory.*"

Before exposing the designs, E. says: "*Ready; look closely.*" When designs are removed, E. says: "*Go.*" Designs are exposed with greatest length of page horizontal, and with front of Guide toward E. The time limit is *2 minutes*, but S. is not stopped or penalized if he appears to have the correct plan and is carrying it out. If the raw score on (*a*), (*b*), and (*c*) together is less than 3, (*d*) need not be given.

Scoring.—Emphasis is put upon reproduction of the plan of the designs rather than upon the neatness of the drawing. Credit as follows:

(*a*) 1. Two lines crossed, four flags 1
2. Correctly facing one another 1
3. Accuracy (lines nearly equal, nearly bisected, nearly at right angles; flags nearly square) 1
Total possible points, 3.

(*b*) 1. Large square with two diameters 1
2. Four small squares within a large square 1
3. Two diameters in each small square 1
4. Sixteen dots, each alone in a small square 1
5. Accuracy of proportion (width of spaces around the four small squares between ¼ and ½ the width of the 16 *smallest squares*) .....

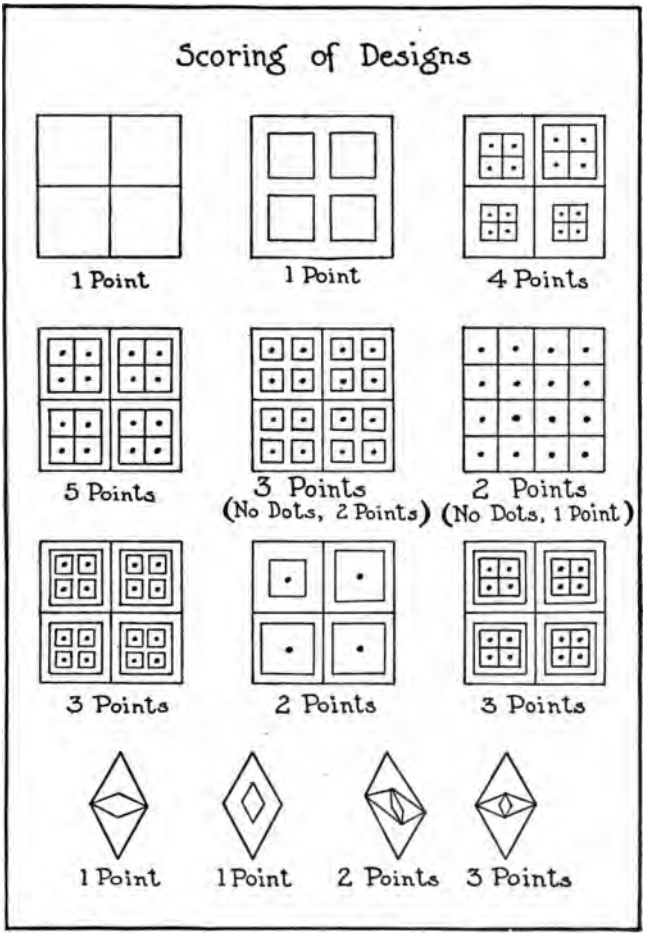


FIGURE 16 (4).

6. If design is complete but with superfluous squares or lines, count only 3 points.

Total possible points, 5.

See Fig. 16 (4) for some common variations.

(c^1) A rectangle with approximately vertical lines
1. Dividing it approximately equally (into not over 6 parts).. 1
2. Dividing it into 4 parts..... 1
Total possible points, 2.

(c^2) A rectangle with approximately vertical lines
1. Dividing it into parts at least 3 of which diminish in size to the right..... 1
2. Dividing it into 6 parts..... 1
Total possible points, 2.

(d^1) 1. Large diamond with small diamond inside crosswise with its vertices approximately coincident with obtuse angles of large diamond; or large diamond with small diamond inside with sides approximately parallel to those of large diamond (alternative to 1)..... 1
2. A third diamond with its vertices approximately coincident with the obtuse angles of the second..... 1
3. Accuracy (the proper lines very nearly parallel and the acute angles of diamonds all nearly equal)..... 1
Total possible points, 3.

(d^2) 1. A large square with sides approximately equal, and small square inscribed..... 1
2. A third square inscribed in second square approximately bisecting sides of second square..... 1
Total possible points, 2.

The maximum raw score for entire test, 17 points.

Test 7.—The Digit Symbol Test

Materials.—See page 3 of record blank. Page 290, this book.

Directions.—The part of the first row marked *sample* is used for demonstration. E. says: "*You see these numbers and the little mark below each number* (pointing to the row at the top of the page). *Now, I want you to put in each one of these squares* (pointing to the empty squares in the three rows) *the little mark that ought to go there, like this: Below 2 put this little mark* (beginning at 2 in the sample), *below 1, this; below 3, this;*" etc.

After doing five of the samples E. pauses and asks: "*Now, what should I put here?*" (indicating the next empty square). If S. answers correctly, E. finishes the samples himself; if S. fails, E. tells him and repeats the question with the next sample. After finishing the demonstration, E. says: "*Now, you begin here and fill as many squares as you can before I call time.*"

Time, *2 minutes.*

Scoring.—The score is the number of squares filled correctly in the time limit. Maximum raw score, 67 points.

Test 8.—The Maze

Materials.—The four mazes (*a*), (*b*), (*c*), and (*d*) on page 4 of the record blank and maze (*a*) on page 3 for demonstration.

Directions.—E. shows S. demonstration maze and says: "*You see these lines. Now, I am going to begin here at S and mark with my pencil the shortest way out without crossing any lines. Watch carefully.*" E. places sheet so that the bottom of the maze is toward S., and traces the way out, calling attention to the possibility of taking the wrong path at one or two of the critical points. E. says: "*You see, if I should go this way, it would not be the shortest way out. I should have to turn back.*" E. then presents test maze (*a*) on page 4 and says: "*Now, with your pencil begin at S and mark the shortest way out as quickly as you can. Do not cross any lines and do not turn back unless you have to. Ready—Go ahead.*"

If S. crosses a line, not through carelessness, E. says: "*You have crossed a line here. You see it is not an open space. Begin here* (indicating a point on the pencil mark just before it crossed the line) *and see if you can find a path out without crossing any lines.*" In scoring, S. is penalized 1 point for each line crossed as above.

Mazes (*b*), (*c*), and (*d*) should be presented in the same way as (*a*) except that no further demonstration is allowed. Time limit for each maze, *2 minutes.* If the score on (*a*) and (*b*) is 0, the test may be discontinued.

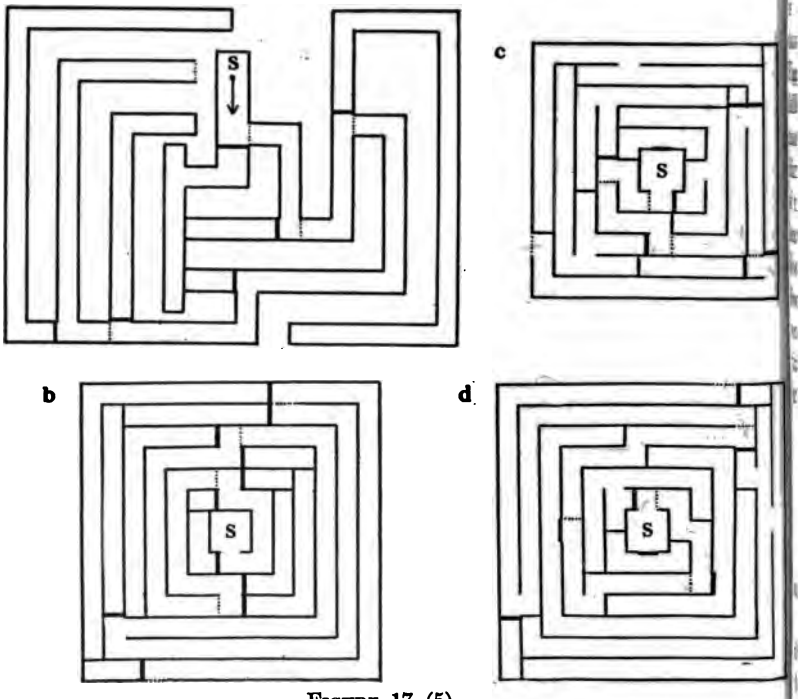


FIGURE 17 (5).

Scoring.—Time is recorded in seconds from start signal to successful exit. If this occurs within the time limit, credit for time is given for each maze as follows:

Time	*Credit*
0– 20	3
21– 40	2
41– 70	1
71–120	0

Whether S. finishes in the time limit or not, credit is given for the degree of success he has attained as follows: Each maze

is divided into five successive steps, which are indicated by dotted lines crossing the path of the maze in the key maze, Fig. 17 (5). A credit of 1 point is given for each step successfully accomplished; i. e., for each imaginary dotted line crossed, making a total of 5 points for each maze. The openings of all blind alleys are indicated by heavy black lines across the path of the maze. A penalty of 1 point is given for each imaginary heavy line crossed. Thus the *score equals the number of dotted lines crossed minus the number of heavy lines crossed, and maze lines crossed not through carelessness* (see above). Any negative score thus obtained counts as zero. (No matter how many times any dotted line or heavy line is crossed, only one credit or penalty is given therefor.)

Maximum raw score, 32 points.

Test 9.—Picture Arrangement

Materials.—Five sets of "Foxy Grandpa" pictures, Figure 18, one set for demonstration, and four for actual tests.

Directions.—E. presents demonstrational set (*x*) in a row in the order 4—2—6—3—1—5 and says: "*These pictures tell a funny story if they are placed in the right order.*" E. then proceeds to arrange the pictures properly, telling the story as he does so, and calling subject's attention to the proper sequence of the important details. He next removes this set, and presents set (*a*), saying: "*Now see how quickly you can change these pictures around so as to make them tell a good story.*" S. is not told if he is wrong, but E. goes on to the next set. Sets (*b*) to (*d*) are presented in the same way. The sets are shown in a row in the order 4—2—6—3—1—5 and 5—1—3—6—2—4 alternately. The time limit for each set is *three minutes.*

Scoring.—E. records the time and the arrangement for each set; and gives a credit of 1 point for each pair of pictures in correct juxtaposition, i. e., a maximum of 5 points for accuracy *for each set. When,* however, the error in arrangement con-

sists only in the reversal of one, two, or three juxtaposed pairs, a penalty of 1 point is given for each such reversal. Thus a credit of 4 points is obtained for arrangement 1—2—4—3—5—6,

FIGURE 18.—Materials for test 9, picture arrangement. This figure was not included in the Examiner's Guide.

which would receive only 2 points credit for correctly juxtaposed pairs.

No credit is given for time unless the arrangement is correct. Then credit as follows:

Time	*Credit*
1– 30	3
31– 60	2
61–120	1
121–180	0

Maximum raw score, 32 points.

FIGURE 19.—Test 10, picture completion. Representing pictures to be completed. This figure was not included in the Examiner's Guide.

Test 10.—Picture Completion

Materials.—Two boards upon which are depicted su
scenes from the day's activity of a boy; and 60 small
from which are selected the pieces to complete the p
Figure 19.

Directions.—The boards are placed before S., part 2
right. The 60 small pieces are placed above the boards

FIGURE 20.—Test 10, picture completion. Representing th
tures from which selection is made. This figure was n
cluded in the Examiner's Guide.

box arranged in a *predetermined order* as indicated in t
In this arrangement ambiguous pieces are located in th
area. E. says: "*Here is a picture—it begins here* (poin
demonstration picture) *where the boy is getting dress
shows the same boy—remember, the very same boy—do
thing after another during the same day.* (E. points alo
row and then along second to indicate the sequence in
the pictures come.) *You see in each picture a piece is*

Scoring of completion test

[The value of *minus 5* is to be given to all placings where in the table below no numbers are inserted. These represent the marked absurdities.]

VALUE OF PIECES IN PICTURES

Pieces	*I*	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*
1					2					**12.5**
2	0	0	1	2		0	0	0	0	0
3							1	**15**		
4					0					6
5							0	0	0	
6	0			0						
7	0	0	1	2		0	0	0	0	0
8	**6.5**			2						
9		5	0		0					0
10	0			1						
11	1			8						
12		0			0					1
13		5	0		3					1
14							1	6		
15			1			1	0	0	0	
16							0	0	0	
17							1	6		
18			0			**9**		0		
19		2			0					0
20										
21		0			1					0
22					2					6
23	1			**17**						
24					0					6
25							2	0	0	
26			0			4	0	0	0	
27		5	0		1					0
28			0			4	0	0	0	
29										0
30	2			2						
31	1			8						
32		0			**7**					0
33							1	7		
34							**5.5**	0	0	
35			**12.5**		0	0				0
36			1			2	0	0	0	
37		0	4		0	0				0
38										0
39							0	0	1	
40										1
41		0			2					0
42	0			2						
43		0			2					0
44			1			1	0	0	0	
45	3			2						
46	0	0	6	0	0	0				0
47		5	0		1					2
48							0	0	**5**	
49		**10**	0		1					2
50	0						0	0	1	
51	0	0	1	2		0	0	0	0	0
52	1			8						
53	0	0	1	2		0	0	0	0	0
54							0	0	0	
55			6		0	0				0
56							2	0	0	
57							0	0	1	
58	0	0	1	2		0	0	0	0	0
59							0	0	2	
60		0	2		0	0				0

Here are a lot of small pieces. They go into the empty places. You are to pick out the piece that you think is needed, that is best to make the picture right. For example, what is gone here?" (pointing to demonstration picture). If S. answers correctly, E. says *"That's fine. Now see if you can find the best piece for each of the other places."* If S. does not answer correctly, E. finds the piece for him, explains why it is right, and then says: *"Now see, etc.—"* as above. E. gives no help after the first explanation, but S. is allowed to change pieces if he wishes. When S. indicates that he has finished as well as he can, time is recorded. The time limit is *10 minutes.*

Scoring.—No credit is given for time, but the very slow are indirectly penalized by not finishing in the time limit. The scoring of the performance is indicated in the accompanying table. When a square is left unfilled, the score for that item is 0. Negative score on the entire test counts as zero.

Maximum raw score, 100.

(b) PROCEDURE FOR NON-ENGLISH-SPEAKING SUBJECTS

E. should take care that his directions do not appear too artificial. For this reason he should not always remain absolutely silent. He should try to use whatever words are intelligible to his subject. "No," "Yes," "Hurry," etc., can be used in most cases; and even when S. does not understand, it is often better for E. to speak as well as gesture. The aim here is only to make the instructions intelligible apart from the language used.

Test 1.—The Ship Test

E. shows S. the frame with the pieces properly fitted therein. After S. looks at picture for 10 seconds, E. withdraws picture, removes pieces and presents the empty frame and the pieces arranged as in Fig. 13 (1). E. points in order to S., to the pieces, to the frame, and nods affirmatively. If S. does not understand, E. repeats.

Test 2.—Manikin and Feature Profile

E. places pieces before S. as previously described. Then points to S., to pieces, nods affirmatively, and sweeps hands together over pieces to indicate that they are to be assembled. This may be repeated. If S. does not understand, or if pieces are not properly assembled in the time limit, E. demonstrates part (*a*) and goes on to (*b*).

Test 3.—Cube Imitation

E. places the cube board before S. as previously described; then taps the first imitation problem slowly, puts down the tapping cube, points to S., and nods affirmatively. If S. fails to understand, E. repeats; if he begins at the wrong end, E. shakes head negatively, points to the first cube, and repeats the problem. E. should make sure he has subject's attention before tapping any problem.

Test 4.—Cube Construction

(*a*) E. presents model 1 and the corresponding blocks, points to bottom, top, and sides of model; then places it upon the table and assembles the blocks rather slowly, turning each block over in the fingers and pointing to painted and unpainted sides. E. now presents the same model and the blocks in irregular order, then points in order to S., to the model, to the blocks, and nods affirmatively. E. repeats, if S. does not understand.

(*b*) E. presents model 2 with the nine blocks for its construction; shows S. bottom, top, and sides of model; then places it upon the table, points to S., to the model, to the blocks, and nods affirmatively. E. repeats gestures, if S. does not understand.

(*c*) E. presents model 3, turns it over slowly, showing each side, presents blocks, picks up a block, points to painted side, shakes head, points to unpainted side, nods, puts down block, points to S., to model, and to blocks, nods affirmatively.

Test 5.—Form Board

E. places board before S. as previously described, points to square and to empty spaces, and proceeds slowly to change blocks and put in square. E. next removes board, rearranges it for problem (*a*), and again presents it to S. He then points to S., to square, and to board, nodding affirmatively. If S. does not understand, E. repeats gestures; and if problem is not solved in the time limit he again demonstrates the correct solution and passes on to (*b*). Problems (*b*) and (*c*) are presented in the same way except that they are not demonstrated in case of S.'s failure.

Test 6.—Designs

E. shows S. demonstrational design (*x*) for 10 seconds. Then he takes it away and draws it for S. He now shows test design (*a*) for 10 seconds; then takes it away, gives S. pencil and paper, points to S., to paper, nods affirmatively. If S. does not respond, E. draws it for him, then passes on to (*b*). Designs (*b*), (*c*), and (*d*) are presented in the same way except that E. does not demonstrate further.

Test 7.—Digit Symbol

E. shows S. the record sheet, points to blank below 2 in the sample, then to symbol for 2 at top of page, writes in symbol, proceeds in the same way with the other parts of the sample, then gives S. pencil, points to space below 3 in the test, and nods affirmatively.

Test 8.—The Maze

E. shows S. demonstration maze (*a*), and with his pencil proceeds to trace the shortest way out. At critical points he hesitates, moves pencil in wrong direction without marking, shakes his head, and continues to work in the right direction. He next presents test maze A, gives S. pencil, points to starting

point and to exit of maze, and nods affirmatively. If S. fails to understand, E. demonstrates again with maze A and passes on to (*b*). Mazes (*b*), (*c*), and (*d*) are presented in the same way, but no more demonstration is given.

Test 9.—Picture Arrangement

E. presents demonstrational set and allows S. to see it for about 15 seconds. Then, making sure that S. is attending, he slowly rearranges the pictures and points to each one in succession, attracting subject's attention especially to the sequence of important details. Next E. removes these pictures and presents set (*a*), points to S., and moves his hand about the pictures to indicate that they are to be arranged. If S. does not understand, E. shows him the proper arrangement and then goes on to set (*b*). Sets (*b*), (*c*), and (*d*) are presented in the same way as (*a*), except that no further demonstration is given if S. fails.

Test 10.—Picture Completion

E. places material before S. as previously described. He then slowly points to the same boy in each of the pictures in succession to indicate the proper sequence of events. He next returns to the demonstrational picture, points to dressed and undressed foot and to empty space. Next he looks leisurely over the small blocks, tries the slipper or the low shoe in the space, points to dressed foot, and shakes his head negatively. Then he puts in the correct piece showing satisfaction with result. Finally, he points in order to picture 1, to S., to small blocks, and to the empty space in the picture, and nods affirmatively. If S. does not understand, E. repeats.

(c) DIRECTIONS FOR USING RECORD BLANK

In general, the subject is given credit for both speed and accuracy or degree of success; and the record blank is designed

to convert time and accuracy measurements into points of credit without delay or inconvenience.

As soon as S. has completed tests 1, 2, 4, 5, 8, or 9, or any part of any one of them, E. checks the space containing the figures which include the subject's time. In tests 1, 2, and 9, he next scores the performance for accuracy; and, if the conditions for crediting time are fulfilled, he adds the credit below the time checked to the credit for accuracy and records the sum in the column marked "score." In tests 4 and 5, E. also checks the space which includes the number of moves; and, if the conditions for crediting are fulfilled, he adds the credit below time checked to the credit below moves checked and records the sum in the column marked "score," as above. In test 8 time is checked and the credit for time added to the credit for success, etc., as before. The abbreviations T. L. in these tests means "time limit"; and this space is checked only when S. is actually stopped before the test or part of the test is completed.

In test 3, E. records the response only when it is incorrect; but always writes + or — in the proper column. In test 10, the number on the back of the block selected for a given picture is written below the number of the picture, and the credit for that part is written in the next space below. If no block is selected for any given picture, E. leaves that space blank. Tests 6 and 7 require no explanation.

The score for each part of tests 2, 4, 5, 8, and 9 are written in the column marked "score"; and then these part scores are totalled below the heavy line, except in test 2, where the total for the two parts is merely written at the foot of the space for score. In all other tests only the total score for the test is written in the "score" column.

(d) DIRECTIONS FOR WEIGHTING PERFORMANCE SCALE SCORES

The raw score for each of the 10 tests is converted into a *weighted or equalized* score, which is entered on the perform-

ance-scale record blank and on the psychological record card in the column headed: "Wtd. score." This weighted score is obtained by means of the accompanying table. In the table all the possible raw scores for each test are listed in columns bearing the number of the test. The weighted scores corresponding are listed in the columns under the letter "W" at either side of the page. For example, to convert a raw score, in test 1, into a weighted score, look at the column under figure 1, find the raw score, and take the score in either column W. which is on the same line. Thus, the weighted score corresponding to the raw score 19, in test 1, is 13. The weighted score corresponding to the raw score 35, in test 7, is 15, etc.

TABLE FOR WEIGHTING PERFORMANCE SCALE SCORES

W.	1	2	3	4	5	6	7	8	9	10	W.
0	0-3	0-1	0	0-1	0-2	0	0	0-3	0-1	0	0
1	4-6	2	.....	2	3-5	1	1-4	4-7	2	.....	1
2	7-9	3	1	3	6-7	2	5-7	8-10	3	.....	2
3	10-11	4	.....	4	8	.....	8-10	11-13	.....	.....	3
4	12	5	.....	5	9	3	11-13	14-15	4	1-2	4
5	13	6	2	6	10	.....	14-15	16	.....	3-5	5
6	14	.....	.....	7	11	4	16-17	17	5	6-8	6
7	15	7	.....	8	.....	.....	18-19	18	.....	9-11	7
8	16	8	.....	9	12	5	20-21	19	6	12-14	8
9	17	.....	.....	.....	.....	.....	22-23	.....	.....	15-17	9
10	.....	9	3	10	13	.....	24-25	20	7	18-20	10
11	18	.....	.....	11	14	6	26-27	.....	8	21-23	11
12	.....	10	.....	.....	.....	.....	28-29	21	9	24-26	12
13	19	.....	.....	12	15	7	30-31	.....	10	27-30	13
14	.....	11	.....	13	.....	.....	32-33	22	11	31-33	14
15	20	.....	4	.....	16	8	34-35	.....	12-13	34-37	15
16	.....	12	.....	14	.....	.....	36-37	23	14-15	38-40	16
17	21	.....	.....	15	17	9	38-39	.....	16-17	41-44	17
18	.....	.....	.....	.....	.....	.....	40-41	24	18	45-47	18
19	.....	13	5	16	18	10	42-43	.....	19	48-50	19
20	22	.....	.....	17	.....	.....	44-45	.....	20	51-53	20
21	.....	14	.....	.....	19	11	46-47	25	21	54-56	21
22	.....	.....	.....	18	20	.....	48-49	.....	22	57-59	22
23	23	15	6	19	.....	12	50-51	26	23	60-62	23
24	.....	16	.....	20	21	.....	52-53	.....	24	63-65	24
25	.....	.....	.....	21	22	13	54-55	.....	25	66-68	25
26	.....	17	7	22	.....	.....	56-57	27	26	69-71	26
27	24	18	.....	23	23	14	58-59	.....	27	72-74	27
28	.....	.....	.....	24-25	24	.....	60-61	28	28	75-77	28
29	.....	19	8	26-27	.....	15	62-63	29	29	78-80	29
30	25	20	.....	28-30	25	16	64-65	30	30	81-86	30
31	.....	.....	9	.....	26	17	66-67	31	31	87-92	31
32	.....	.....	10	.....	.....	.....	.....	32	32	93-100	32

(e) AN ABBREVIATED PERFORMANCE SCALE

If time does not permit the giving of the complete performance scale, a short scale selected from tests 1, 2, 3, 4, 6, 7, and 8 may be used. These tests must be given in the following order: 7, 6, 2, 4, 8, 1, 3 (or 3, 1). After each test is given E. should compute the weighted score obtained by S. up to that point; and he may discontinue the examination after the first test, if the score is 14 or more; after the second, if it is 22; after the third, if it is 27; and after the fourth, if it is 32. The fifth test should be given if the score on four tests is less than 32; but only very rarely need more than five tests be used.

If S. is absolutely illiterate (whether American or foreign born), E. should begin with test 6 instead of 7, and follow the same procedure.

If the examination is discontinued after the first test, S. should be rated D (C —, if the score is 21 or more) and as a rule recommended for regular service. If two or more tests are given, a final score should be obtained by finding the average for the tests actually given and multiplying by 10. The letter rating for this score can then be read from the table of norms for the *short scale*. If eight or more tests are given, the norms for the long scale should be used

(f) EXPRESSING AND INTERPRETING RESULTS

The results of the performance scale examination should be pressed in the following ways: (1) Total weighted score; (2) ter rating; (3) mental age. The letter ratings corresponding various scores and mental ages are as follows:

Complete scale	*Short scale*	*Mental age*
3	2	4.5
4	5	5
6	8	5.5
9	12	6
17	17	6.5
30	24	7
41	33	7.5
52	42	8
62	53	8.5
72	67	9
91	86	9.5
114	108	10
135	127	10.5
153	144	11
166	158	11.5
175	169	12
183	179	12.5
189	188	13
195	197	13.5
201	205	14
208	214	14.5
216	223	15
223	232	15.5
230	241	16
237	250	16.5
244	259	17
251	267	17.5
258	275	18
268	283	18.5
290	291	19

Letter ratings should be assigned as follows:

	Complete scale	*Short scale*
A	260–311	275–308
B	240–259	250–274
C+	215–239	220–249
C	190–214	190–219
C—	150–189	145–189
D	90–149	85–144
D—	0– 89	0– 84

Grade E should be given to all men who are recommende by the examiner for discharge, Development Battalion, or ser ice organization, *and to such men only.* All men whose intel gence is deemed satisfactory for regular military duty shall l given rating of D— or higher.

Subjects obtaining a score of 100 points or more (short scal may ordinarily be recommended for regular military trainin subjects obtaining 40 to 99 points should be considered f assignment to service organization or Development Battalio those below 40 points should ordinarily be considered f discharge.

5. MECHANICAL-SKILL TEST

The mechanical test is intended for use (1) in aiding decisi in doubtful cases under individual consideration, and (2) as special test of mechanical skill.

Materials.—One set mechanical test (Stenquist), sing series 1.*

Instructions.—Place the open box before S. with the cov toward him. Say, "*Here are some things that have been tak apart. You are to put them together. Begin here* [pointing to A *take the parts and put them together so that the thing will wor*

* Consists of ten small mechanical objects taken apart. Each set pieces is placed in a separate compartment. The objects are in order use: wrench, chain, paper clip, bicycle bell, coin holder, clothespin, "sht off," push button, lock, and mousetrap.

Then go on to this one [pointing to B]; *then to the next, and so on. If you come to one that seems very hard, go on to the next one, and if there is time later try it again. The more things you get done the larger your score. Ready—Go.*"

Time for the entire test, *30 minutes.*

Scoring.—Give 10 points for the complete and correct assembling of each object. Total possible score, 100.

If the assembling of any object is only partially correct, give partial credit, according to the schedule. A list of the possible steps in the assembling is given for each object. Note in each case of partial solution which steps have been completed, and give credit for each step as indicated. The items included in a brace are alternative reactions, therefore give credit of only one number of points from any brace.

It will be noted in D, for example, that, failing only to screw cover on, S. gets but 6 points, while screwing the cover on counts but 1 point. The additional 3 points of penalty are for lack of "workability." If any step is omitted in the solution of any object except E, then item of "workability" is considered as lacking. In E, however, credit of 2 points is given for workability if the solution is correct except only 2 sides snapped or caps out of order, or both.

In case of the lock, the spring is properly inserted when the bend is hooked over the projection in the frame to prevent slipping. By "Spring inserted workably" is meant one of the three other workable positions in which it is possible to place the spring, but which make no use of the bend.

In the case of the mousetrap, by "in slot" is meant that the long arm of the spring is inserted in the slot of the U-shaped band. By "Right way," reference is made to the direction in which the U-shaped band snaps. A "weak snap" is occasioned by having the spring or springs inverted. If one spring is more nearly correctly inserted than the other, count best one; that is, give credit for the best spring, and for that only, except in the last case.

Schedule of scores

A:
- Head inserted correctly... 2
- Nut screwed on—
  - Properly between cross bars of handle..... 4
  - Otherwise..... 1
  - Score (wrench).... ( )

B:
- Complete chain of single joined links..... 3
- One correct joint between links..... 2
- Two correct joints..... 4
- Three correct joints..... 6
- Four correct joints..... 8
- Score (chain)..... ( )

C:
- Thumb lever inserted in armholes—
  - Below spring, arm of lever out..... 3
  - Above spring wrong side forward..... 8
  - Score (tube shut off) ( )

D:
- Thumb lever on pin either way..... 1
- Gear on pin right side up in mesh with lever..... 1
- Knockers right side up in mesh with gear..... 2
- Cover screwed on..... 1
- Spring hooked..... 2
- Score (bell)..... ( )

E:
- Center stud in place..... 2
- Springs in place..... 1
- Caps in place—
  - Out of order.....
  - In order.....
- Cover snapped—
  - Two sides.....
  - Three sides.....
- Workability.....
- Score (coin box)... (

F:
- Spring correctly placed on one stick.....
- Imperfect usable clothespin—
  - Unsymmetrical.....
  - Symmetrical.....
- Score (clothespin).. (

G:
- Small lever in place.....
- Lock bolt in place.....
- Spring inserted—
  - Workably.....
  - Properly.....
- Top fitted on properly and screw inserted.....
- Score (lock)..... (

H:
- Both levers backward....
- One forward clear in, other backward.....
- Other part way in, forward.....

Both part way in, forward 5
Both clear in, forward, one facing wrong..... 8
Both facing wrong... 9
Score (paper clip).. ( )

I:

Button properly inserted in upper ring..... 2
Circuit-closing disk properly fitted in bottom ring..... 2
Rings snapped together... 3
Score (electric button)..... ( )

J:

U-shaped band held in proper place by pin or wire..... 1
Trip lever on pin—
Improperly..... 1
Properly..... 2
Wire lever hooked—
Improperly..... 1
Properly..... 2
Springs on pin (count best one)—
Weak snap, not in slot, either way.... 1
Weak snap, in slot, either way..... 2
Strong snap, in slot, wrong way..... 3
Strong snap, in slot, right way,
One spring..... 4
Both springs.... 5
Score (mouse-trap)..... ( )

ABBREVIATED MECHANICAL TEST

The abbreviated mechanical test includes only iter D, E, and G of the complete test. Time, 15 minute each item according to directions given above and dou sum to secure the total score.

Table of norms

(Derived from 909 cases; 303d Engineers, Camp Di

Score	*Precentile rank, per cent*
0	0
10	1.5
20	6
30	12
40	22
50	37
60	53
70	69
80	83
90	94
98	100

Letter rating	*Score*
A	96–100
B	80–95
C	40–79
D	20–39
E	0–19

APPENDIX A

Table of equivalent scores

Alpha	*Beta*	*Point scale*	*Complete performance*	*Short performance*	*Stanford-Binet*
					4.0
			3	2	4.5
			4	5	5.0
			6	8	5.5
			9	12	6.0
		31.5	17	17	6.5
		36	30	24	7.0
	2	42	41	33	7.5
	6	46	52	42	8.0
2	11	51	62	53	8.5
4	17	55.5	72	67	9.0
7	24	60	91	86	9.5
11	30	64	114	108	10.0
16	37	68	135	127	10.5
21	42	71	153	144	11.0
27	47	74	166	158	11.5
33	53	77	175	169	12.0
40	58	79	183	179	12.5
47	63	81	189	188	13.0
56	67	83	195	197	13.5
63	71	85	201	205	14.0
71	75	87	208	214	14.5
78	78	88	216	223	15.0
85	81	90	223	232	15.5
93	84	92	230	241	16.0
102	88	95	237	250	16.5
114	91	98	244	259	17.0
125	95	100	251	267	17.5
137	99		258	275	18.0
147	104		268	283	18.5
161	108		290	291	19.0

Basis for the assignment of letter grades

	Alpha	*Beta*	*Point scale*	*Whole performance*	*Short performance*	*Stanford-Binet*
A.....	135–212	100–118	Not given	260–311	275–308	18 –19.5
B.....	105–134	90–99	95–100	240–259	250–274	16.5–17.9
C+....	75–104	80–89	90–94	215–239	220–249	15 –16.4
C.....	45–74	65–79	80–89	190–214	190–219	13 –14.9
C.....	25–44	45–64	70–79	150–189	145–189	11 –12.9
D.....	15–24	20–44	60–69	90–149	85–144	9.5–10.9
D —....	0–14	0–19	0–59	0–89	0–84	0 – 9.4

APPENDIX B.—EXAMINER'S OUTFIT *

I. A supplementary outfit is furnished at the commencement of camp examining to provide for the immediate needs of the staff. This outfit includes:

(1) 6 gross lead pencils.
(2) 3 pencil sharpeners.
(3) 2 typewriters.
(4) 2 typewriter tables.
(5) 1 chest of tools.

Additions to and replenishment of these materials must be secured regularly from the medical supply officer by requisition through the division or camp surgeon.

II. Psychological equipment, as such, consists of three groups:

(A) Group examining outfit.
(B) Individual examining outfit.
(C) Printed materials.

The regular procedure for increasing or replacing these supplies is a request through military channels addressed to the Surgeon General of the Army, attention Division of Psychology.

The various items under psychological equipment are listed below.

(A) Group examining:
1. Beta outfit—
(*a*) Blackboard frame.
(*b*) Beta chart.
(*c*) 6 cardboard pieces, test 7.
2. Alpha stencils for each form.
3. Beta stencils.

* Appendices B and C are retained as they appear in the guide. They will give the reader some understanding of the minimal equipment necessary to handle the work of examining large numbers of men day after day. The building space indicated is actually less than was used in the majority of the camps.

(B) Individual examining:
1. Point-scale materials.
2. Stanford-Binet materials.
3. Performance-scale materials—
   (*a*) Ship test.
   (*b*) Manikin.
   (*c*) Feature profile.
   (*d*) Cube construction.
   (*e*) Cube imitation.
   (*f*) Form board.
   (*g*) Picture arrangement.
   (*h*) Picture completion.
4. Mechanical skill test.

(C) Printed materials:
1. Group examination alpha, five forms.
2. Group examination beta.
3. Point scale examination.
4. Stanford-Binet examination.
5. Performance scale examination.
6. Psychological record.
7. Report of psychological examination.
8. Examiner's guide.

APPENDIX C.—BUILDING AND EQUIPMENT

ɔllowing authorization by the Secretary of War for con-
ɔtion in each camp of special psychology building, it was
ded to secure, wherever possible, the assignment of small
acks building, and to remodel the same for psychological

Suitable building for psychological examining has been
gnated in many of the divisional training camps. In others,
porary arrangements have been effected. For the use of
school of military psychology, Medical Officers' Training
ıp, Fort Oglethorpe, Ga., a special psychology building has
ı constructed.

ı general, it is desirable that building for psychological
nining be located conveniently near receiving and exam-
g station of camp, and if possible also near the personnel
e and the office of the camp surgeon and psychiatrist.
ɜre there is a depot brigade the building should be either
r near the same. Since the psychologist will have important
ɜtions in connection with the development battalion, it also
ıld be considered in selecting location for psychological
k.

or the information of examiners and their guidance in select-
and planning for the remodeling of such building as they
· secure for their work, the plans of special psychology
ding are reproduced herewith.

ı planning modifications for any assigned building, it is well
ɜeep in mind the fact that other uses than psychological
nining will be found for the psychological building. In
original plan it was intended that the Division of Psychiatry
ıld also have an office in the building and, where necessary,
cient examining space for individual examinations and con-
ɜtion. In certain of the camps plans are already on foot
ıse this building for medical conferences, for conferences
veen psychiatrists, psychologists, and line officers, for ad-
ıses to the line officers on morale, and for discussions and

conferences on methods of instruction, and training of the new recruit.

The first floor of the original building was planned to contain alpha and beta examining rooms and a storeroom for heavy materials. The alpha examining room was planned to seat on the floor 160 to 200 men. This room was without benches, but the necessary space for each man is marked out roughly by lines running crosswise of the length of the room. These lines were spaced 3 feet apart. Since the men were to be seated on the floor or on small wicker mats, it was deemed desirable to make the floor of this room of double thickness. A small reading stand with shelves was planned for the large examining room. The small examining room, or beta room, was planned to seat between 60 and 100 men. A bench designed for this room, with its partitions and other measurements, is shown in Fig. 23 (8). It was also deemed desirable to have in this room a raised platform, about 18 inches high, from which the demonstrations could be more easily seen from the back of the room. A bank of lights so arranged as to illuminate the beta blackboard will be found essential on cloudy days. Cross-lights should be avoided. Lights in alpha room should barely clear the tallest men.

The storeroom should have built-in shelves sufficient to enable the examiner to unpack at least one week's supply of the necessary examining materials. Similar shelves should be planned for the scoring room, record room, office, and small storeroom. Shelves in the record room can be made wider than usual shelving, so that if long, narrow boxes are built to contain the record cards they may be placed lengthwise across these shelves. Other necessary changes are indicated on the plan.

A certain amount of furniture, either built by the construction quartermaster or supplied through the camp quartermaster upon requisition, is indicated in the plan. Examiners should have on hand at least 250 strips of beaver board 12 by 18 inches, *wicker mats for the* alpha examining room, if possible, and a

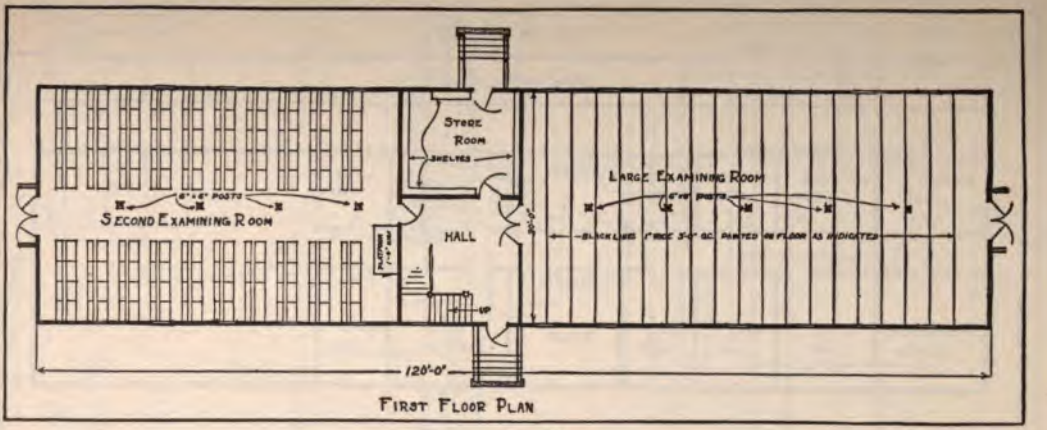

STEEL ROOM
SHELVES
LARGE EXAMINING ROOM
6"x6" POSTS
SECOND EXAMINING ROOM
6"x6" POSTS
HALL
BLACK LINES 1" WIDE 3'-0" OC. PAINTED ON FLOOR AS INDICATED
120'-0"
FIRST FLOOR PLAN

FIGURE 21 (6).

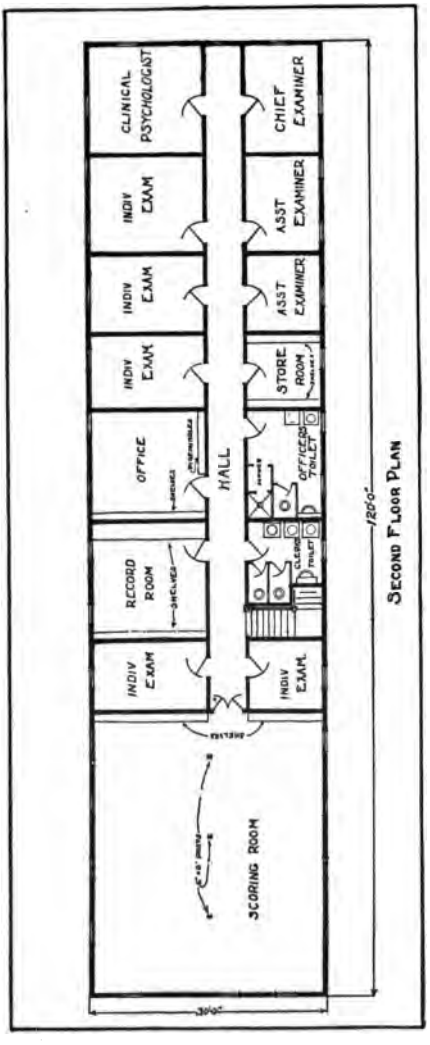

CLINICAL PSYCHOLOGIST
CHIEF EXAMINER
INDIV EXAM
ASST EXAMINER
INDIV EXAM
ASST EXAMINER
INDIV EXAM
STORE ROOM
OFFICE
HALL
OFFICERS TOILET
RECORD ROOM
INDIV EXAM
INDIV EXAM
SCORING ROOM
SECOND FLOOR PLAN

FIGURE 22 (7).

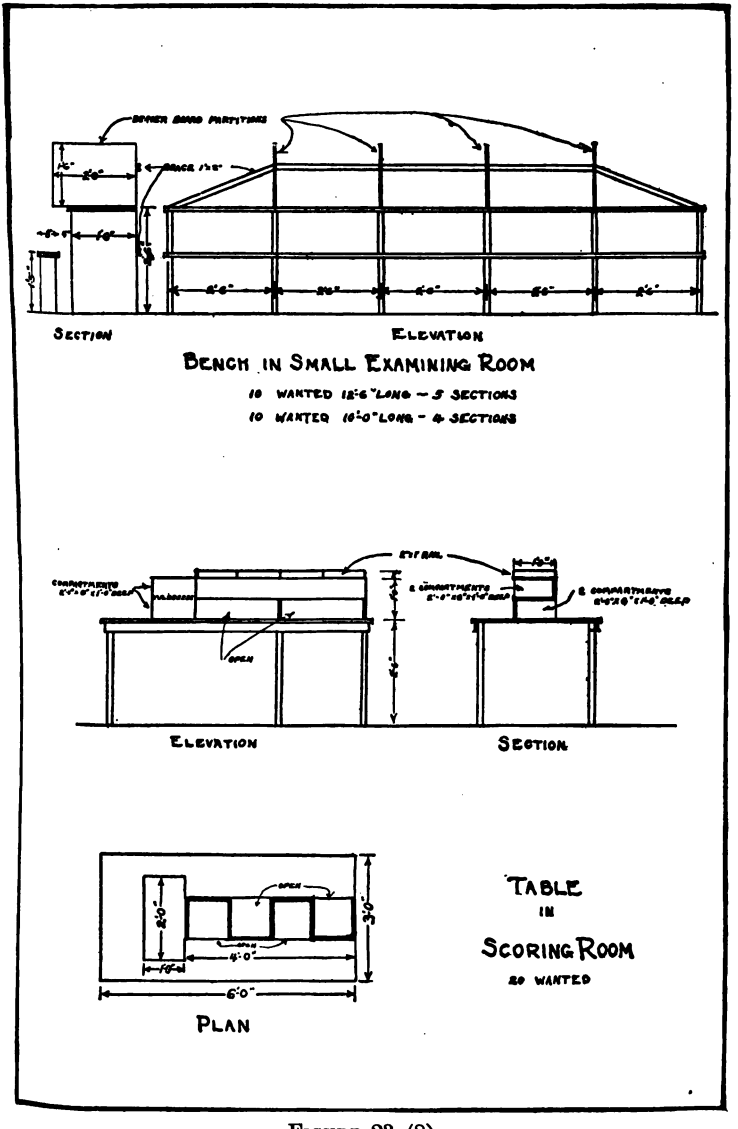
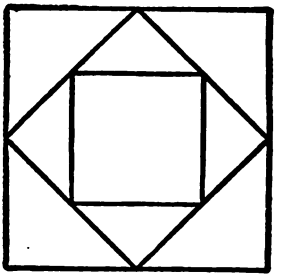

SECTION
ELEVATION
BENCH IN SMALL EXAMINING ROOM
10 WANTED 12'-6" LONG — 3 SECTIONS
10 WANTED 16'-0" LONG — 4 SECTIONS
ELEVATION
SECTION
PLAN
TABLE
IN
SCORING ROOM
20 WANTED

FIGURE 23 (8).

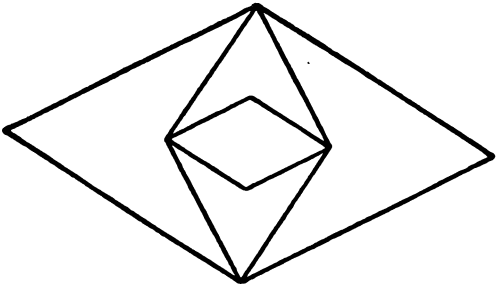
sufficient supply of wall hooks for overcoats and hats of thos being examined. Each of the individual rooms on the secon floor should be supplied with small tables. In addition, abou 20 small tables, 3 by 6 feet, 30 inches high, are needed in th scoring room. According to the desire of the examiner, thes tables may be supplied with special scoring tops, as indicated i the specifications and plan in Fig. 23 (8). For the regular wor of the examining staff and scorers at least 75 ordinary chai should be sufficient.

This is a brief description of the building and equipment originally planned for the psychological examining staff. It obvious that no one of the buildings already constructed ca be adapted to meet these suggestions exactly. The origin plan and equipment are presented here as suggestions rath than as essential in all details. It is essential that the individu examining be done under as uniform conditions as possible. is necessary that the chief examiner have a definite address ar office within the camp boundaries, and it is further essenti that proper storage space be furnished and supplied with loc or guards to protect against loss of examining materials. is also necessary, for accurate scoring and recording, that pe manent and sufficient floor space be supplied for the scori unit. Outside these essential and necessary requirements ar the expendible equipment necessary to carry on the examinin scoring, and recording, physical properties will vary conside ably from camp to camp.

Test 6, d. 1, d. 2

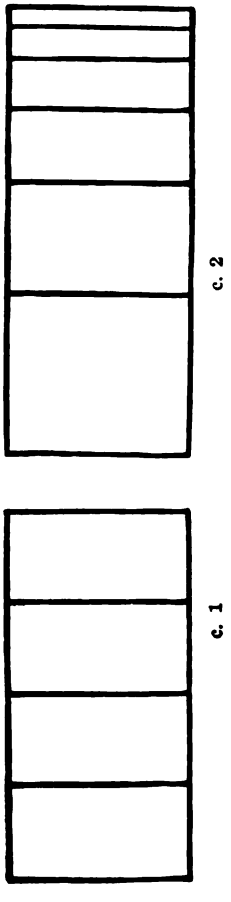


d. 2.

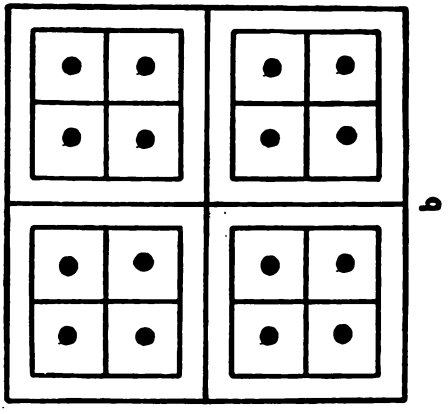


d. 1.

Test 6, c. 1, c. 2


c. 2
c. 1

Test 6 b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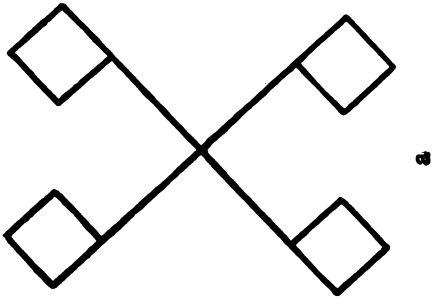
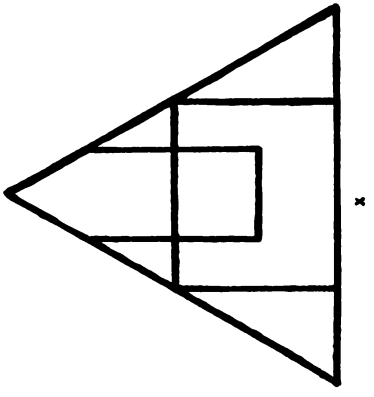
Test 6, a



Test 6, Demonstration Design



CHAPTER IV

ARMY TESTS IN THE STUDENTS' ARMY TRAINING CORPS AND COLLEGES

The form of the Examiner's Guide prepared by Major Lewis M. Terman for use in the Students' Army Training Corps differs slightly in directions for its use and in the method of giving instructions to the subjects for all separate tests except one. The instructions were not read aloud to those taking the tests. The time limits, in consequence, were changed slightly to include a portion of the reading time. All other cautions and directions are identical with those of the regular army guide. It was unnecessary to prepare tests for illiterates and defectives since the early plans of the corps did not include instruction for the non-English reading men of draft age. The form containing the essential changes is reproduced here.

INTRODUCTORY STATEMENT

The instructions presented herewith are for the conduct of examination alpha, the intelligence test prepared especially for literate men in the army. With minor exceptions the procedure is the same as that used with other literate recruits.

The purposes of the alpha examination in the Students' Army Training Corps are:

(a) To secure an objective rating of all students according to general intelligence, as an aid in their final classification for service;

(b) To acquaint prospective officers with the nature and value of the psychological ratings which are in general use in the Army;

(c) To aid in the educational guidance of students;
(d) Where the examination can be given at the opening of a new term, to aid in the selection of candidates for admission.

When the examination cannot be given as part of the entrance requirements, it should be given as early as possible after the opening of a new term. The results, if promptly available, will be of value both in the educational guidance of the students and in the evaluation of their work.

In order to eliminate all possibility of coaching, the following precautions should be taken:

(1) Different forms of the alpha examination booklet should be used in successive terms. In general, it will be advisable not to use a given form more than once in a school year of four quarters.
(2) The examinations in a given school should be completed in the shortest possible time. In the smaller schools, all the students may ordinarily be examined in the same half day, and in the larger schools in one, or at most, two days.
(3) The greatest care should be taken to prevent the dissemination of examination booklets. Before the men are allowed to leave the room after an examination, the number of booklets collected should be carefully checked against the number distributed. Used blanks and blanks held in reserve should be safeguarded by the examiner according to directions furnished by the Regional Director of Psychological Tests.

The number of men who should be examined in a group will be determined largely by the available space. Groups of 100 to 200 men are preferable, but under suitable conditions groups of 300 or 400 are readily handled. Crowding, however, should be avoided. When circumstances will permit, the men should be assigned to alternate seats.

It is necessary that some kind of support be provided for the booklets. If there is no suitable room which is fitted with desks, or with chairs having arm rests, then each student may be supplied with a book on which to rest the examination blank during the examination.

While discipline must be preserved throughout the examination, it is necessary that the men be made to feel at ease. Statements which might cause apprehension or nervousness should be avoided. Generally speaking, little should be said by the examiner beyond giving the directions for the separate tests.

The procedure, as set forth in the following pages, should be adhered to rigidly. The directions should be given in the exact words indicated. No supplementary instructions of any kind are permissible. The rule that no questions shall be asked should be strictly enforced. Each test should be timed with a stop watch and care should be exercised to avoid error in timing. A few extra pencils, sharpened, should be at hand to supply men who need a new one during the examination. Pencil, not pen, should be used in all cases.

PROCEDURE

After the men have been seated, each is given a pencil. Then E. (examiner) should say: "We are going to pass around some papers now; don't turn any of the pages until I tell you to." Alpha booklets are then distributed, face up, the greatest care being taken to see that no one is given more than one booklet. As soon as the booklets have been distributed, E. should continue, slowly and distinctly, pausing after each instruction to give subjects time to respond:

"Now, at the top of the page, print your name after the word 'Name.' Print your last name first, then your first name, and then your middle initial, if any." After name has been written, say: "Put your age in years after the word 'Age.'" (Pause.) "Next, in the third line, write the name of the state or country in which you were born. If you were not born in

this country, tell the number of years you have lived in th United States." (Pause.) "After the word 'race' writ the word 'white.'" (In examining negro groups substitute th word "Negro.") "Next go to the line that begins with the wor 'schooling' and draw a line under the highest school grad you attended *before* you entered the S. A. T. C. For example if the last grade you attended before you entered the S. A. T. C was the fourth year of high school or preparatory school, dra a line under High School, Year 4. If you had reached th second year of college before entering the S. A. T. C., draw line under College, Year 2, etc."

When everything is ready, E. proceeds as follows: "Atten tion! The purpose of this examination is to see how well yo can remember, think and carry out what you are told to do It is a test of general mental ability, and will *help* to find ou what you are best fitted to do in the army. Such tests are give to all enlisted men in the Army. The results have proved to b of great value. The grade you make in this examination wi be put on your Qualification Card and will become a part o your permanent record. Some of the things you will be give to do are *very* easy. Some you may find hard. You are no expected to make a perfect grade, but do the very best you ca

"In the Army a man often has to listen to commands an then carry them out exactly. I am going to give *you* som commands to see how well you can carry them out. Liste closely. Ask no questions. Do not watch any other man t see what *he* does.

"Look at your papers. Just below where you have bee writing, there are several sets of forms—circles, triangles, an so forth. First you will be told to do something with the circl at 1, afterwards with the circles at 2, and so on.

"When I call 'Attention,' stop instantly whatever you a doing and hold your pencil up—so. Don't put your pencil dow to the paper until I say 'Go.' (Examiner lowers his pencil Listen carefully to what I say. Do just what you are told

do. As soon as you are through, pencils up. Remember, wait for the word 'Go.'"

N. B. Examiner.—Give the following instructions very distinctly and at moderate speed. After giving the command "Attention," always notice carefully and have orderlies notice whether all pencils are up. Never proceed until they are. This is especially important in the beginning. Be careful to use the directions that fit the *form* of alpha booklet distributed. Be careful not to pause or to drop the voice in the course of a compound direction, e. g., in 2, before the words "and also." Raise your pencil whenever you say "Attention." Lower it promptly whenever you say "Go."

Instructions for test 1, each form, are exactly the same as in the original guide.

When the examiner is through giving the directions for test 1, he says:

"During the rest of this examination don't turn any page forward or backward unless you are told to. Now turn over the page to test 2."

Test 2.—Arithmetical Problems

"Attention! Read the directions at the top of the page and do what they tell you to do. I will say stop at the end of five minutes. Do as many as you can in the time allowed.—Ready—Go!"

After **5 minutes,** say "STOP! Turn over the page to test 3."

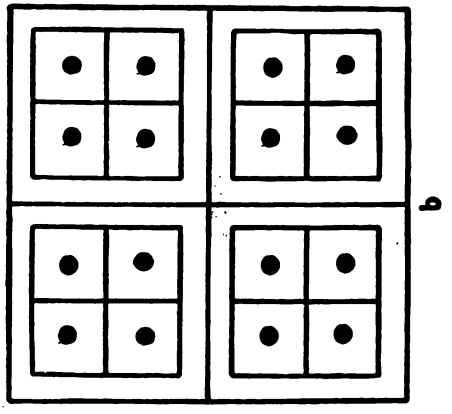
Test 3.—Practical Judgment

Attention! Read the directions at the top of the page and do what they tell you to do.—Ready—Go!"

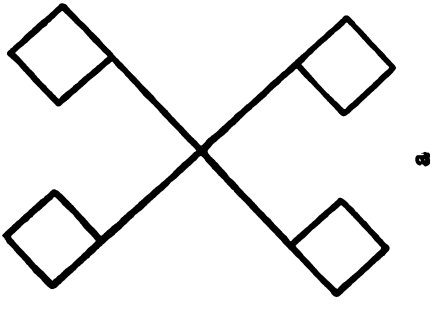
After **1 minute and 40 seconds,** say "STOP! Turn over the page to test 4."

Test 4.—Synonym—Antonym

"Attention! Read the directions at the top of the page and *do what they tell you to* do.—Ready—Go\"


b

Test 6, a



Test 6, Demonstration Design

the examinations were given were truly representative of the institutions. There are from Brown University, for instance, records of only 210 men. This group is such a small proportion of the total registration that the chances are very much against its being a representative group. At some of the institutions the tests were given only to those who volunteered to take them, a procedure which introduces a factor of selection. Sometimes the records were obtained from only one class. Such a limitation probably gives a selected group; the figures from the University of Illinois show distinct class differences.

A third factor making for variability in the results is the fact that tests were given under widely varying conditions and by many examiners, most of whom were untrained. While the chances of variations from this cause are not large, the possibility of such variations must be held in mind while examining the figures.

Table 2 shows the distribution of alpha scores in several of the larger groups, and Table 3 the median scores, quartiles, and percentages of A and B grades for the groups listed in the table. There are wide differences between these groups. The medians vary from 111 for the normal school women to 130 for the college men, and the percentage of A and B grades combined for the same groups varies from 57.4 to 75.2. None of the groups makes a record as high as that of the army officers chosen for the principal sampling for Hollerith analysis, but all groups rate higher than the army sergeants, who made 50 per cent of A and B grades. The men of the Students' Army Training Corps and the Reserve Officers' Training Corps seem to offer good material for the selection of officers for the army.

TABLE 2

TRIBUTIONS OF ALPHA SCORES FOR VARIOUS GROUPS FROM EDUCATIONAL INSTITUTIONS

	15 S. A. T. C. (men)	*8 R. O. T. C. (men)*	*20 Colleges (men)*	*4 Normal schools (men)*	*13 Colleges (women)*	*7 Normal schools (women)*	*All Colleges (men and women)*
....			5				5
....	4		7				7
....	10	1	11		1		12
....	11	1	12	2	4	3	16
....	29	4	38	0	5	1	43
....	55	2	41	1	13	3	54
....	79	9	66	1	16	4	82
....	103	12	92	4	38	10	130
....	137	8	99	2	36	4	135
....	141	22	123	3	69	8	192
....	152	26	175	3	62	17	237
....	189	24	183	4	88	17	271
....	188	29	180	4	83	19	263
....	202	37	199	10	98	33	297
....	204	35	188	6	93	28	286
....	197	37	189	13	109	35	298
....	193	45	184	7	98	45	282
....	179	44	175	7	98	46	273
....	178	41	158	15	99	44	257
....	166	37	133	8	92	56	225
....	130	34	131	7	78	41	209
....	123	29	131	9	75	49	206
....	97	35	95	6	79	35	174
....	83	24	84	12	71	37	155
....	76	27	78	7	45	32	123
....	52	17	86	3	35	35	121
....	49	16	60	3	32	27	92
....	36	18	44	7	22	26	66
....	18	18	43	3	11	22	54
....	27	13	34	5	8	8	42
....	15	2	42	1	4	9	46
....	11	5	28	4	0	11	28
....	4	5	16	1	1	3	17
....	5	2	9	2	3	7	12
....	1	2	11	0	2	5	13
....	1	0	11	2	2	1	13
....	1	1	10	0	2	2	10
....		0	2	0			2
....		1	2	0			2
....				1			
....							
....							
....	3,146	663	3,175	163	1,575	723	4,750

TABLE 3

SUMMARY

Median alpha scores, quartiles, and percentages of A and B grades made by various groups from educational institutions.

	Median	*Lower quartile*	*Upper quartile*	*% A's*	*% A's and B's*	*No. cases*	*No. institutions*
College men	130	105	154	44.8	75.2	3,175	20
College women	127	106	142	38.8	75.2	1,575	13
College men and women combined	127	105	150	42.8	75.4	4,750	22
S. A. T. C. men	133	111	153	48.0	81.1	3,146	15
R. O. T. C. men	121	97	141	31.6	67.6	663	3
Normal school men	115	85	135	24.5	59.5	163	5
Normal school women	111	90	130	20.4	57.4	723	7
White officers' principal sampling	139	116	161	55.6	84.1	15,385	

In Table 4 an analysis is made of the records of five units of the Students' Army Training Corps which included more than a hundred men. Here again wide differences are apparent.

TABLE 4

STUDENTS' ARMY TRAINING CORPS

Median alpha scores, quartiles, and percentages of A and B grades made by various Students' Army Training Corps groups

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
Dartmouth	147	132	165	70.6	94.5	595
Case School, Cleveland	145	125	161	63.0	90.4	472
U. of California	135	116	153	50.0	84.0	621
U. of Texas	126	109	141	38.0	78.4	717
Coll. of Wooster, Ohio	124	104	144	34.8	73.7	208
15 S. A. T. C.'s combined	133	111	153	48.0	81.1	3,146
White officers' principal sampling	139	116	161	55.6	84.1	15,385

Two of the groups of the Reserve Officers' Training Corps were made up of more than a hundred men each, and these two groups are compared in Table 5. There is a difference of ten points in the median scores and a difference of 18.5 per cent in the number of A and B grades obtained.

TABLE 5

RESERVE OFFICERS' TRAINING CORPS

Median alpha scores, quartiles, and percentages of A and B grades made by various Reserve Officers' Training Corps groups

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
The Citadel, Charleston, S. C.	125	107	144	37.6	77.8	222
Virginia Polytechnic Institute	115	89	135	24.2	59.3	368
3 R. O. T. C.'s combined	121	97	141	31.6	67.6	663
White officers' principal sampling	139	116	161	55.6	84.1	15,385

The figures for various groups of college men are presented in Table 6. Here the differences are even more striking, for the medians range all the way from 80 to 150, while the percentages of A and B grades run from 17.4 to 95.5. Several colleges present here a better record than that made by the white officers in the principal sampling.

TABLE 6

COLLEGE MEN

Median alpha scores, quartiles, and percentages of A and B grades made by various groups of college men

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
Mass. Agri. Coll.	150	135	164	74.2	95.5	154
Rutgers	138	131	163	69.4	94.0	358
Brown University	142	125	160	61.4	88.5	210
Colorado College	142	126	162	57.4	88.5	148
Johns Hopkins, Freshmen	137	116	155	53.0	85.0	140
Notre Dame	137	116	152	53.6	82.6	321
U. of Minnesota, Freshmen	129	109	142	42.4	79.9	534
Southern Methodist Univ.	127	108	146	42.1	79.3	162
U. of Idaho	125	107	145	38.8	76.6	277
U. of Florida	120	87	144	30.2	66.9	215
Lincoln Memorial, Tenn.	86	56	121	8.2	36.4	171
Atlanta Southern Dental College	80	57	95	7.0	17.4	184
20 Colleges combined	130	105	154	44.8	75.4	3,175
White officers' principal sampling	139	116	161	55.6	84.1	15,385

The data for the women from various colleges (shown in Table 7) again emphasize the differences between institutions. The variations are not so great as they were in the case of the college men, but they are large enough to be significant.

TABLE 7

College Women

Median alpha scores, quartiles, and percentages of A and B grades made by various groups of college women

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
Colorado College	142	125	156	61.2	89.8	178
U. of Minnesota, Freshmen	128	109	145	40.3	78.8	354
U. of N. Dakota	129	107	153	44.0	77.0	117
State Teachers College, Colo.	122	100	141	32.4	75.8	266
Southern Methodist Univ.	123	102	141	32.8	70.6	159
U. of Idaho	117	99	139	29.8	68.6	169
13 colleges combined	127	106	142	38.8	75.8	1,575

None of the normal schools reported records of enough men to make a study of the differences worth while, but the fact that there are large differences between normal schools as well as between colleges is shown in Table 8, which gives the results for four groups of normal school women.

TABLE 8

Normal School Women

Median alpha scores, quartiles, and percentages of A and B grades made by various groups of normal school women

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
First District, Missouri	124	112	140	37.0	83.8	111
Peru, Nebraska	122	103	143	35.2	72.9	162
Millersville, Pa.	117	98	129	16.4	67.2	140
Sam Houston, Texas	88	71	105	4.2	24.9	236
7 Normals combined	111	90	130	20.4	57.4	723

In Table 9 the division is by sex. While the median scores made by the women are in every case a few points lower than the median scores for the men in similar groups, the differences are so small that they may be regarded as insignificant. The same statement may be made regarding the percentage of A and B grades combined. The men tend toward a higher proportion of A grades.

TABLE 9

SEX

Intelligence ratings according to sex

		Colorado College	*U. of Minnesota, Freshmen*	*Southern Methodist University*	*U. of Idaho*	*Colleges combined*	*Normal Schools combined*
Median.....	Men	142	129	127	125	130	115
	Women	142	128	122	117	127	111
Quartile deviation.....	Men	18	17	19	19	25	25
	Women	16	19	20	20	18	20
Per cent A grades	Men	57.4	42.4	42.1	38.8	44.8	24.5
	Women	61.2	40.3	32.8	29.8	38.8	20.4
Per cent A and B grades.....	Men	88.5	79.9	79.3	76.6	75.4	59.5
	Women	89.8	78.8	70.6	68.6	75.2	57.4
No. cases.....	Men	148	534	162	277	3,175	163
	Women	178	354	159	169	1,575	723

As the data sent by the University of Illinois were grouped according to the department of study it was possible to investigate possible intelligence differences between the various departments. These data are set forth in Table 10. As would be expected, the graduate students rate considerably higher than the students in the undergraduate departments, but this is the only difference of importance. The very slight drop for the students of agriculture probably is not significant.

TABLE 10

DEPARTMENTS WITHIN A UNIVERSITY

Intelligence ratings of students in various departments of the University of Illinois

	Median	*Lower quartile*	*Upper quartile*	*% A grades*	*% A and B grades*	*No. cases*
Literature, Arts and Sciences	145	128	162	65.4	93.0	1,410
Commerce	143	126	159	61.8	93.3	539
Agriculture	139	125	157	58.0	90.7	385
Engineering	144	127	160	63.9	93.2	755
Graduates	154	137	170	77.0	93.8	161

Differences between the men in the four years of college were also obtained from the Illinois data. The results are shown in Table 11. There is a slight but definite increase in the percentage of higher grades with the longer stay at college, presumably as the result of the elimination of poorer men.

TABLE 11

COLLEGE CLASS

Intelligence grades according to college class of students at the University of Illinois

	Intelligence grades						
	C—	*C*	*C*+	*B*	*A*	*A and B*	*No. cases*
Freshmen.....	.1	.8	7.7	33.4	58.0	91.4	1,342
Sophomores...		1.5	6.2	28.6	63.7	92.3	730
Juniors.....		.7	5.1	27.8	66.3	94.1	607
Seniors.....			4.2	19.7	76.2	95.9	410

The chart reproduced on page 36 (figure 10) is of interest in connection with possible uses of such examinations in our high schools and higher institutions of learning. All of the students had been selected because they were judged by their commanding officers to have the necessary qualifications for success as army officers. They were believed to have the necessary physique, leadership, ability, intelligence, initiative and responsibility.

The following discussion of tests in colleges is quoted from an article by Lt. Col. W. V. Bingham in the *Proceedings of the American Association of College Registrars* for 1919.

"These men were all given the army intelligence examination. *The results* were grouped according to army standards into *the grades A, B, C* plus, C, C minus, D, D minus and E. But

there was none who scored D minus or E. Of those who scored C minus, or D, about seven-eighths failed to get through the course of training. Of those who scored C, about one-half succeeded and one-half failed. Of those who scored A or B, about eight-ninths succeeded. In other words, intelligence, while by no means the only factor in determining their success in the officers' training schools, was enough of a factor so that even with such a rough tool of measurement as the army intelligence examination, it was possible to predicate with some certainty that anyone who scored C, C minus or D, was probably wasting his time in going to an officers' training school.

"Another chart (page 34, figure 8) illustrates the tremendous inequalities of ability in various companies within a single regiment when the men were assigned to the companies haphazard or by geographical location. The captain in command of Company D with a small percentage of A and B men and a large fraction of illiterate and foreign born soldiers was expected to train his men and get them ready for France at the same time that the captain of Company E got his men ready, and yet the captain of Company E had a large percentage of men, who, as far as intelligence was concerned, were officer material and he had only a small proportion of the illiterate or foreign. College instructors sometimes face a similar situation of inequality in their classes, having to cover the ground in the same length of time that other instructors do who have very different material to work with. Among 15,385 officers whose intelligence scores are here tabulated, only one made a rating as low as D; 84.1% of the 15,385 officers' sampling made ratings of A or B, a proportion quite similar to the proportion of college students with A or B mentality as measured by the same tests.

"During the past four years the Carnegie Institute of Technology has been developing and utilizing the group method of examining students. There has been a gradual evolution in these tests, in which several progressive stages are to be noted.

"First, a number of different kinds of tests that seem promis-

ing are given to a large group of students, and the results for each test are plotted in the form of a percentile graph. In the number-completion test, for example, the scores made by the students are plotted against the percentages of students who attained each score. Such a graph is very convenient later on in making a comparison between the performance of any individual student and that of the large group as a whole. Knowing his score in the test, one can say instantly, by reference to the chart, that this student is superior to say 67% of his class.

"The next stage is to compare these test rankings with scholarship records and with estimates of the students' ability made by their instructors. These statistical comparisons show that some tests are much less indicative of success in college than others. Such tests are eliminated and the following year new tests are tried in their place.

"When a student's score is obtained in several tests that have proven to be reliable, it is convenient to prepare a diagram that may be called his 'psychological profile.' One student, for example, in the Margaret Morrison Division, the vocational college for women, ranked in the lowest 10% of her class in the opposites test, in the lowest 8% in the analogies test, in the lowest 5% in the completion test, and so on. Her psychological profile chart shows at a glance that in only one test did she do better than the lowest 25%. That student was soon dropped for poor scholarship. The average faculty estimate of her ability placed her very near the bottom. It was 1.67 on a scale of ten. The faculty estimate, made after three months' acquaintance with tne student, agrees with the psychological test made on the day of entrance.

"The mental profile of another student, instead of running near the bottom of the chart is almost entirely in the upper half, showing instantly that in nearly all the tests she excels the majority of her classmates. She is, as a matter of fact, a good student, the faculty estimate on her ability being 9.8 on a scale of 10.

"By such means as these the Institute has tried to make the information regarding the intelligence test records of its students conveniently available to the administrative officers: it has also endeavored to improve the tests year by year. The work is under the immediate direction of Professor L. L. Thurstone. He has recently combined the results of previous experience into a new group test in two parts. Each part requires less than half an hour to give. It is called the "cycle-omnibus test"—"omnibus," because it includes in one test several forms of tasks, such as marking true and false statements, analogies, opposites, proverbs of similar meaning, etc., and 'cycle,' because these varied forms of task are presented in succession repeatedly. The forms of task selected for this cycle-omnibus test are those which have already proven their worth as indicators of the ability of students to do college work satisfactorily.

"It is interesting to make a comparison between the reliability of psychological tests and other means ordinarily employed for predicting success or failure of college students, such as college entrance examination grades, high school records and the like.

"Three of the best criteria of success that are employed in the college entrance procedure of the engineering school are: the entrance examination in algebra, the dean's interview rating, and the rating given by the high school principal based upon the boy's performance in the high school. Combining those three criteria and using them for prediction of the students' success, it is found that they correlate about .40 with instructors' estimates made after the students have been known to them for one semester. That correlation is somewhat higher than college entrance examinations taken alone ordinarily give. I do not know just what the results have been with the College Entrance Examination Board examinations of the past years. When Thorndike some years ago computed the correlation between college entrance examinations at Columbia and the student's scholarship standing in the college, he found prac-

tically zero correlation. In other words, the student's performance in the entrance examination was no prediction whatever of the degree of his success with his college studies.

"When we used last year as a basis of prediction for the engineering students, three of the dozen or so tests that we had been working with at Carnegie, the correlation with instructors' estimates was .48. It was somewhat better than when the combined high school record, algebra examination and Dean's interview rating were used. But here is a significant point. If we combine the information from those sources with the test scores, the coefficient of correlation is raised to nearly .57. We get a more reliable prediction by using both the old criteria and the new criteria in combination. Information obtained by such psychological methods will undoubtedly have its value in connection with problems of admission to college. This question of admission is one that suggests desirability of making improvements in two directions. Is it not possible to admit a larger number of students who are now excluded but who could profit by the college course? Is it not possible to exclude from college a larger proportion of the students who now come to college and fail, who leave with the brand of failure upon them, having wasted their own time and their fathers' money?

"The use of psychological methods ought to help in solving both of these problems. It should make possible more elasticity in the administration of entrance requirements.

"In the state universities and middle western colleges there is an enormous mortality in the freshman year. Perhaps, that is the way it ought to be. We ought to give everybody an opportunity who can possibly make good in college. But at the same time we ought to make more of an effort to exclude those who, even though they may be high school graduates, cannot possibly succeed in college, and direct them toward a type of training that they could really profit by. How is one to suggest wisely the direction in which a student not able to take college *training should* turn? Can mental tests be of any assistance

whatever in specific vocational guidance? At some far distant date psychological methods are going to be a help even in this difficult task of guidance. They cannot help to-day. I mean that there exist now no adequate psychological tests of specialized vocational talent. One striking exception to that generalization is Seashore's tests for the measurement of musical talent. But in general, psychology has very, very little to offer in the way of specialized tests of ability in different vocations.

"Mental tests are, however, tools of some reliability in determining general intelligence, in ascertaining the level of a person's ability to learn to profit by experience and to adapt himself to changing demands. These tests are not 100% perfect, but they are reliable up to a certain point; and to that extent I am confident they are going to find a useful place in university administration, not only with reference to the administration of admissions, but also in the guidance of students in the problems they face throughout their academic career.

"In conclusion, let me offer one word of caution against encouraging the adoption of psychological methods unless faculty and administration are quite ready to coöperate in checking up the results and in putting them to use. The group examinations should be followed up by more detailed individual examinations of students who make a poor score. Individual examinations should also be made of students who are known to be on the verge of failure in their work, to ascertain definitely whether their poor showing is due to lack of native ability. All this work takes a great deal of time and should not be required of psychology instructors who already are carrying full schedules of teaching. Any thorough-going program for the use of psychological methods in university administration should include provision of time and funds for an additional specialist in individual psychology and mental measurement." *

* See the Appendix to "A Study of Engineering Education," 1918, by Charles R. Mann, The Carnegie Foundation, for a more detailed study of prediction by the use of objective tests.

The suggestions contained in the above results of mental tests are of considerable importance in the systematic study of college personnel. The demonstrated value of the work of the Committee on Classification of Personnel in the Army and of the Division of Psychology of the Surgeon General's Office should not be lost.

The suggestions for systematic study and coöperation in research contained in an article recently published by one of the editors of this volume seem pertinent here. The dignity of the study of human qualities is worthy a still more pretentious plan.*

"Personnel classification in the formation of the United States Army brought into high relief certain difficulties that institutions dealing with the training and education of young men and women had vaguely felt. A few institutions had attempted to set into operation methods aimed at the solution of these questions. The systematic and persistent exploration of the difficulties and their solution were forced upon the War Department. Its rapid and unprecedented expansion gave clear definition to many unsettled personnel problems. It found the source of supply unanalyzed and its own needs but vaguely in mind. Large numbers of specialists were suddenly demanded. Experience quickly demonstrated that personal qualities were extremely important assets in war. It became necessary to specify in detail the personal, educational and technical requirements for each important task. To insure proper qualifications, specially devised tests proved necessary. The increased size of the army forced it to maintain complete and detailed systems of personnel records and to devise special 'follow-up' methods.

"Army experience can be duplicated in the experience of our educational institutions. We believe that the pressure of war

* Clarence S. Yoakum, Plan for a Personnel Bureau in Educational Institutions, *School and Society*, May 10, 1919, pp. 556–559. Portions of this article are reprinted by permission of the Editor of *School and Society*.

has produced a clearer conception of the problems involved in training and placement. It has emphasized the advantages of carefully systematized procedure in discovering needed qualities of human nature, and the importance of freeing estimates of persons, as much as possible, from the errors of personal bias and incidental acquaintance. Vague memories of so-and-so's personality and qualifications broke down utterly as a means of building up an army.

"This article proposes the general outline of a plan for a personnel bureau. The principal features of such a bureau can be put into operation in any educational institution, large or small. The plan considers the study of student personnel as fundamental in any institution that believes its function connected in any way with the well-being of its patrons and with the success of its graduates in their chosen professions. It also contains the implication that such an institution must keep fuller and more definite records of success and failure, of personalities and of the results of its training and teaching. The essential functions of such a bureau, or committee, are four. Modifications of the plan will emphasize one or the other of these functions, according to local conditions, the specific aims of the institution or the personnel of the bureau itself; subdivision of functions will increase with the growth of the bureau and the financial and moral encouragement given it.

"The primary functions of the bureau are, to obtain accurate data on each student, to codify the requirements of different professions, to supervise the use of tests and to provide means whereby each student may become acquainted with his abilities and the requirements of the occupations in which he is interested. Properly to perform these functions as complete an inventory of the human material passing through the institution as is possible must be made in permanent form. Second, the files of this bureau must contain a similar inventory of the important vocations. Third, the bureau will provide the responsible agencies for bringing to the student seeking a life occupation

all its systematic material on the opportunities and requirements necessary to attain a certain degree of success in those vocations open to him. Fourth, the bureau will proceed on the assumption that all of these problems can be investigated in a scientific manner and will initiate and encourage research in this field.

"The essentials of the inventory of human material can be placed on a single card—the personal history card or qualification card. This qualification card will contain facts concerning the previous history of the individual. This previous history should contain items concerning his social and school life pertinent to the purpose of such an inventory. The card will also be a permanent record of his educational career. It is not necessary to summarize in detail the items involved in such a record. Ratings which will consist of elementary school grades, marks in college or technical school studies and the results of specially devised rating plans will also be recorded on this card. It is further expected that on the student's qualification card space be left for recording the results of intelligence tests and of other tests important in determining the qualifications of the individual. Recent determinations of the usefulness of such intelligence ratings and specialized tests make it probable that in the future no institution will be without such information concerning its student body.

"The information desired as a part of the student's permanent record may be obtained in several well-known ways; though at present none of these is satisfactory. Extremely valuable estimates of the individual's qualifications and qualities of mind and person may nevertheless be obtained by careful interviewing when he reports for entrance to the college or other educational institution. Such estimates as the student himself gives at this interview can be supplemented and checked by carefully prepared letters of inquiry to persons who have known him in his previous school work and outside activities. Additional ratings and estimates on personal qualities and on special

aptitudes should be obtained at least yearly from his instructors and fellow students. These estimates properly tabulated and combined with the objective ratings obtained from the tests give the foundation for tentative judgments of the student's ability and probable future career.

"The second function of this bureau is the collection and classification of vocational information. This should include carefully obtained opinions on the qualities necessary for success in each of the vocations studied. Each vocation should be carefully studied from the point of view of the range of mental capacity that will stand a satisfactory chance for success. A card for a vocation should also indicate minimum and maximum educational qualifications so far as they can be returned. Such a record must also specify the need for any special ability if such is an essential. When properly completed the specifications for any vocation will also include a statement of the more essential qualities necessary for success in that vocation. It is not too much to believe that sometime in the future these may be given their proper weighting in a great many vocations. Bibliographies pertaining to special fields can also be made available to students through the bureau.

"Again much careful investigation is necessary. This part of the work of the bureau must begin at the beginning. The utter lack of agreement on the qualities that produce success and satisfaction in life is easily demonstrated. Whether this failure to agree is a matter of permanent differences indicating many roads to success or satisfaction, or is rather one in which a limited number of qualities receive different weights under definitely describable conditions, is surely a problem worth experimentation. Minimal requirements of education and training can undoubtedly be specified and standardized.

"The third important function of this personnel bureau will be to bring to the student seeking a life vocation all material collected on vocations. By proper methods of cataloguing this material can be readily presented to the student. In this con-

ference section of the bureau, problems concerning his colleg advancement may also be taken up with the student. It is, o course, here that the importance of the objective tests can mos readily be seen. The collection and recording of the informatio as described above will be of extreme advantage to the dean and to others whose duty it is to discuss with the student hi place in the school work and his success in advanced studies.

"Properly to develop the fourth function, it is important that a single responsible agency have charge of general intelligence tests and other forms of testing used. This agency should not be within any single school or department of the institution. The value of modern group and individual examinations of relative intelligence is now thoroughly established. The plan proposed aims to make these an integral part of the personnel inventory. The satisfactory development of their values rests on the scientific care and common-sense skill with which they are used. Their proper use is obviously in connection with the two inventories above described. So used they will undoubtedly prove invaluable aids in personal interviews with students.

"The importance of following up the use of tests is, of course, patent. The correlations desired are essential in estimating the significance of tests, the prophetic value of personal data and the weightings for vocational qualifications. Constant revision, retrial and experimentation are implied in this fourth function of the bureau.

"The personnel of such a bureau should be carefully selected. During the first years of its operation and in preparing the final form of organization, its work should be supervised by a general committee. Immediate responsibility for the bureau should be in the hands of a smaller group of men who have shown themselves to be particularly interested in human qualities and their development. If properly managed, it will require part time from at least three men of professional rank. The chairman of this smaller group should be responsible for the general organization of the plan and its coördination with

other university activities. The second member of the sub-committee should be a specialist who is thoroughly acquainted with business methods and vocational specifications. The third member should have special qualities fitting him for personal contact with the student and for the *unbiased* presentation of the requirements of different vocations. The direct management of the affairs of the bureau should be in the hands of a secretary, who should have at least the rank of an assistant professor. It is probable that practically full time will be required of this man, and in the current management of such a bureau he doubtless will be the important active member of it.

"The proposed bureau does not present a scheme for vocational guidance. If an institution or a dean feels that it or he can properly carry the responsibility, the bureau provides the only safe procedure for obtaining guidance in passing out such advice. We believe rather that an institution owes it to its student-body to provide systematically prepared information about life and its business. Further, if the study of human qualities is to be removed from the realm of palmistry and 'get rich quick' schemes, systematized research must provide the means. Persistent and organized research of this type must be done in permanent institutions that will provide continuous and accessible records. Several years of coöperative research among widely distributed institutions might even produce principles for vocational guidance."

CHAPTER V

PRACTICAL APPLICATIONS *

"In an address at the Personnel Officers' School at Camp Meigs less than a year ago, Major-General Hutchinson, C. B. D. S. O., Director of Organization of the British Army, spoke very frankly of the serious mistake of Great Britain in recruiting her skilled labor indiscriminately into fighting units. They made good soldiers, but the plan seriously interfered with the development of technical units and the 'output of many vital things.'

"No one has computed the cost of bringing back those skilled men from the Western Front after they had been trained as soldiers, or of having the vital things made elsewhere that might have been made at home. If it had not been for the great American reservoir of skilled labor it would probably have cost the war. That the United States did not make a similar, and with the exhaustion of the reservoir, a disastrous mistake in the military distribution of our skilled labor is due primarily to the Committee on the Classification of Personnel in the Army.

"The work of this committee is commonly regarded as one of the great contributions of civilians to the efficiency of the Army. It is probably the greatest single piece of mental engineering that has ever been attempted in this country. But it is by no means the only task of the war that was successfully

* The introductory section is quoted from an article entitled "Mental Engineering During the War," by Raymond Dodge, which appeared in *the American Review of Reviews* for May, 1919. It is reprinted here in *part by permission* of the Review of Reviews Company.

met by an application of the principles of the science of human behavior to war conditions.

"Mental engineering as an organized war service of American psychologists began at an informal meeting of experimentalists in the spring of 1917. They asked themselves the universal question, what they could do to help win the war. The answer to that question as it finally evolved, has come to be more than a matter of historic interest, more than a war measure, more than practical applications of a single science. It is a permanent contribution to the organization and utilization of human forces. It inevitably projects itself into the great reconstruction, and supplies at once a prophecy and an obligation.

"The work of the Committee on the Psychological Examination of Recruits was another of the notable mental engineering achievements of the war. Its original purpose was to help to eliminate from the Army at the earliest possible moment those recruits whose defective intelligence would make them a menace to the military organization. But the military value of an early and reliable estimate of the general intelligence of each recruit proved enormously greater than had been anticipated.

. . . . . .

"But in the enormous task of building up an efficient army organization it proved important to discover at the earliest opportunity those recruits who could learn the new duties that were required of them as soldiers in the shortest time. To train the quick learners and the slow learners together in the same companies was an intolerably wasteful process. Moreover, the army needed an enormous number of men with superior intelligence for officers. While high general intelligence did not guarantee good officer material it was a conspicuous fact that good officers regularly ranked high in the intelligence tests. In the selection of men for officer training camps mental tests were obviously preferable to the importunity of influential friends. They *proved greatly* superior to personal impressions.

NECESSITY OF A SCIENTIFIC BASIS

"For a variety of reasons mental testing has aroused an u usually widespread popular interest. It was initiated and fir developed in France as a scientific instrument for educator It has become an important adjunct to the juvenile court, an bids fair to become a valuable instrument for social research and a practicable device for solving a considerable number o perplexing educational and industrial problems.

"For example, the various trades represented in the draft made rather insistent demands not only on physical strength and endurance but also on that ability to meet new and complex situations which we call general intelligence. We commonly deplore spoiling a first-class mechanic to make a poor executive. Apparently the scientific measurement of general intelligence will go a long way in estimating whether a person has the general intelligence that is required for average success in any given trade or profession.

"But it is easily possible to expect too much of mental tests. Prophecy of the future is vastly more difficult than a record of actual developments even in such relatively simple matters as the weather. The only final indicator of the inability of a person to succeed in a profession is failure; and even a failure may be the one factor in the complex conditions of the mental life that is necessary for success. In view of the suddenly developed popular interest in mental tests, it is necessary to point out that no so-called mental test is of the least scientific value unless it rests on a scientific analysis of the process to be tested, and unless it has been thoroughly systematized and statistically evaluated. The preparation of the army tests of general intelligence was a notable technical achievement of far-reaching importance."

Lieut. Commander Dodge gives in a succeeding paragraph an illustration of the steps necessary to the analysis of an interesting psychological problem and to the preparation of

practical methods of using the solution when obtained. The brilliantly successful solution of this problem is due primarily to his skill and insight.

"The first problem that was referred to the sub-committee on vision was the question whether we had any way of selecting those naval recruits who could be trained most quickly as gun-pointers for the armed merchant ships.

"The first step was to learn exactly what a gun-pointer had to do. The next was to reduce the more or less complicated processes of gun-pointing to their simplest neuro-muscular terms. It was a definite problem for analysis; and, because of the perfect systematization and high specialization of naval tasks it was relatively simple. The third step was to adapt approved scientific technics to the study of this particular complex of neuro-muscular processes. For this purpose an instrument was devised that would show all the following facts on a single record line: 1, the time that it took a sailor to start his gun-pointing reaction after the target at which he was aiming started to move; 2, the accuracy with which he was able to 'keep on' the moving target; 3, the time that it took him to respond to a change in the direction of motion of the target; 4, the ability to press the firing key when he was on; 5, the effect of firing on his pointing.

"All these data were so simplified that they could be accurately estimated from simple measurements of a single line without elaborate computations. A succession of records indicated the probable quickness with which the sailor would learn the new coördinations. The final step was to test the probably military value of our instrument and its records by performances of expert and inexpert gun-pointers.

"The first trials proved the usefulness of the device. It clearly differentiated between the qualified gun-pointers, the partially trained, and the untrained. It picked a number of promising novices and indicated the faults of some who were slow to improve. Predictions based on the records were uni-

formly corroborated by subsequent experience. Somewhat later it was possible to construct a robust training instrument along similar lines that was rather enthusiastically reported on by various Naval officers, and was widely reproduced by the Navy for use in the Naval Training Stations.

"At a time when every available gun was needed for service afloat, the utility of our relatively simple and inexpensive training instrument that closely reproduced the coördinations of actual service needs no emphasis."

The emphasis Lieut. Commander Dodge places on the necessity for thorough systematization, analysis and statistical evaluation is timely. The spread of the use of the army intelligence tests and the numerous requests for data regarding them make the emphatic reiteration of this caution extremely important.

Army tests were prepared for a specific purpose. The successful results obtained were due in large measure to the strict limitation of use to that purpose. Any educational, social or industrial applications the tests may have must necessarily be less successful in that degree in which the aim and the groups tested differ from the selected group reporting to the great cantonments to be trained as soldiers. New standards for these tests must be formulated. New tests will need to be devised in many instances. Especially will it be necessary to reinterpret results and establish new critical points in the scale.

EDUCATIONAL APPLICATIONS

The group method of examining school children for general intelligence is already in use. It is proving important as a method of making rapid school surveys for states and cities. Within these units, it enables school principals to make frequent surveys of class rooms in order to discover promptly pupils who are retarded or who are being held in grades too easy for their ability. These rapid surveys indicate quickly and with *a high degree of* accuracy the students who need special atten-

tion. They point out those cases that need more careful individual examination, and give standards of measurement that possess a much greater degree of reliability than have those used heretofore.

A very respectable list of group tests for school purposes is available to-day. Some of these are adaptations of the army tests. One from which extremely interesting results may be expected is being used in the Virginia School Survey. School surveys are in progress in other states using the army intelligence test in the form described in this book. Other group tests in use are to greater or less degree divergent in content but utilize the principles described above in Chapter II. Under the direction of the National Research Council, a group test especially planned for school children is now being prepared. A study of the army tests in the selection and rating of elementary and high school teachers is in progress.

Correlation coefficients for the army alpha test and other measurements of intelligence were presented on page 20. An especially severe test of the army intelligence tests is shown there in the correlation of school grade location of thirteen and fourteen year old pupils. The coefficients of correlation range from .75 to .91. Numerous factors work against such high correlations, for example, the tendency of schools to try the backward pupils in advanced grades regardless of attainment; the large numbers of those who, discouraged by being forced to remain in classes with pupils much younger than they or by the difficulty of the work, drop out of school entirely; and also the chance that brighter pupils because of youthfulness are held back and forced to go more slowly than their ability warrants. Two of these factors tend to displace correct grade location. The other materially reduces the probable range and thereby tends to lower correlations. In spite of these factors, high correlations are shown.

The following table gives the distribution for 139 school children who took Examination A. This is the first army form

of the examination for literates. The table is given here as a sample of the results obtained in preparing for the revision of this examination which resulted in alpha. No alpha results other than correlations are quoted. No school should expect exactly similar scatter tables. The correlation here is . 821.

TABLE 12

Grade score	*4b*	*4a*	*5b*	*5a*	*6b*	*6a*	*7b*	*7a*	*8b*	*8a*	*9b*	*9a*	
300–319 ..													
280–299 ..										1	5		6
260–279 ..									2	4	2		8
240–259 ..								1	2	2	4	1	10
220–239 ..									8	1	2		11
200–219 ..							4	7	3	3	1		18
180–199 ..			1			2	3	3	6	1			16
160–179 ..				1		2	6	6	2				17
140–159 ..					1	3	7	3	2		1		17
120–139 ..		1			5	4	2	1	2				15
100–119 ..		1		2			1						4
80–99.. .		1		1	3	1							6
60–79.. .	1		1		2		1						5
40–59.. .		2	1	1									4
20–39.. .	1												1
0–19.. .		1											1
Total	2	6	3	5	11	12	24	21	27	12	15	1	139

The beta test (the army group test for illiterates and foreigners) has also been used in testing school children. Cases numbering 597 representing all grades give the correlations age with score .76, school grade with score .85. One feature of *the new tests now* being developed is that the characteristics *of the alpha and beta* tests are combined in a single scale. At

the close of active psychological work in the Army, such a combined test was almost completed for army use.

A plan for the specific experimental use of intelligence tests in the schools was presented by Major Yerkes in his Harvey lecture cited above. It is in line with results obtained by similar experiments in the Army.

"From leaders in our school systems, from administrative officers and teachers in colleges and professional schools, and from specialists in educational psychology come requests for permission to use the army mental tests. It is the hope of many of these men that mental ratings, as soon as it is made possible to secure them conveniently and reliably, may be used in our public schools as partial basis for grading, promotion and vocational advice; that they should prove valuable also in institutions of higher learning as partial basis for admission, classification, grading, promotion, assignment to special work, and vocational guidance. Such applications of mental measurement would, it is true, radically change our educational system, for at present mental achievement, the extent of information or the lack of it is virtually the sole basis for admission, classification and promotion. Mental measurement of school pupils, college and professional students indicate extreme differences in mental ability throughout the educational range as well as important differences in the mental constitution. These facts must be taken into account if educational procedure is to benefit the individual in highest degree. It therefore is proposed that children should be classified in accordance with mental ability either as they enter school or shortly thereafter and that mental ability should thereafter be taken into account in connection with their educational treatment.

"The following plan is therefore proposed as a means of utilizing mental ratings in the interests alike of education and of vocational placement.

"On the basis of reliable mental ratings, children should be classified in one of three intellectual groups, which may be

designated by the letters A, B, and C. Group A would consist of children of superior intelligence, group C, of children possessing relatively inferior intelligence; and group B, of those of intermediate grade. The three groups would not necessarily be of equal size.

"Mental classification having been effected, educational treatment should be adapted to the needs and possibilities of the individual. To this end the following facts must be recognized: (1) that both rate of educational progress and limit of educability are conditioned chiefly by degree of native or inborn mental ability, (2) that range of vocational choice varies directly with mental ability. We have assumed that the children of a given grade will be classified in three groups which shall be taught either in the same classroom or in different rooms. Each section shall be permitted and required to progress in accordance with its mental ability, thus group A might readily pass through the grades at twice the speed of group C.

"Up to a certain point in the educational development these three groups can profitably follow the same course of instruction. This point is the completion of the fifth grade of elementary school. By the time this stage of educational development has been achieved, many individuals of the C group will exhibit difficulties in learning and diminution of interest, both of which, as a rule, indicate approach to the limit of one particular sort of educability. In recognition of the fact that there is a limit to the educability of every living being, the diagram indicates that after the fifth grade divergent series of courses will be followed by the three groups. The A grade pupils may profitably continue, if they have the will, their primarily intellectual course of training toward those vocations or professions which require high grade intelligence and excellent educational training. The middle grade individuals may more profitably follow a course in preparation for highly skilled industrial vocations or those lines of professional work which make less exacting educational and intellectual requirements than do the learned

professions, so called. Pupils of grade C should, by contrast, follow a manual training course as a means of continuing to its limit their intellectual development and simultaneously fitting themselves for the most appropriate type of vocational activity.

"Mental classification and educational treatment in accordance with the same, although seemingly undemocratic, is quite the reverse. While boasting of equality of opportunity in our national life and particularly in our educational system, we are, as a matter of fact, seriously discriminating against individuals because of our failure to take their characteristics and needs into account. Equality of opportunity in our schools necessitates classification in accordance with ability, individualized treatment, recognition of limitations and of practical limits of educability, differentiation of courses, and vocational direction and training which shall enable the individual to avoid failure by reason of undertaking the impossible or waste because of the choice of an occupation which makes slight demand upon the ability of the individual." *

SOCIAL SIGNIFICANCE

The army data on racial differences are meagre. The introduction and development of the group tests and the invention of successful individual and group methods for testing the illiterate and non-English speaking will now make it feasible to carry out experiments in mental testing that have previously been impossible. It seems within the bounds of reason to prophesy the development of methods that will finally aid in defining racial and environmental likenesses and differences. For the present two or three steps of social significance are indicated.

The problem of illiteracy has been emphasized by the re-

* This plan was more fully described in *National School Service*, Feb. 15, 1919, pp. 6–7.

cruiting of the draft army. Attention has been focussed on this great educational problem by the facts brought out by the Army's attempt to instruct the draft. Psychological methods have aided in the discovery of those unable to learn and in the classification according to literacy. The group method of examining, checked up later by individual examination for failures, throws each man on his own resources. It establishes a check on progress after leaving school and by careful use will shortly enable us to standardize a practical definition of illiteracy or literacy.

Many men in the Army reporting fourth and fifth grade schooling proved unable to make scores in the army test for literates (alpha) because they could no longer read in anything but a halting manner and because the simple arithmetic problems carried no meaning. Many of these write letters with frequent misspelled words and no longer read more than a few of the headlines in newspapers. The general intelligence examination offers an objective standardized test both in the schoolroom and without, to measure actual ability in mastery of these important social tools. The discovery of the semi-literate is a secondary use of the group test. Its correlation with school grade is high; and the results, in the primary grades, are, therefore, excellent indications of success in the mastery of the necessary elementary equipment of a citizen.

The interrelations of illiteracy, crime, prostitution, poverty, mental disease and mental deficiency are by no means clear. The methods of investigation are in their infancy. Means of measuring degrees of importance of this or that factor are still primitive. The very definition of the traits that may or may not be responsible for the social results enumerated is still to be accomplished. Specific delimitation and formulation of these problems are much needed.

In lieu of something better the army methods of testing intelligence were used to assist if possible in the solution of these pressing problems. The question of discipline is extremely im-

portant to the morale and efficiency of an Army. It seemed probable that one of the causes of crimes in the army is the lack of a sense of responsibility due to feeble-mindedness. Many summary court cases were first tested by the army psychologists. They were called in to testify in numerous other instances. Minor breaches of discipline were frequently reported to the psychologist for examination and recommendation. It was not an unusual sight in the camps to see a soldier under guard in the psychological building awaiting mental examination.

A complete survey of the Disciplinary Barracks at Fort Leavenworth was made shortly after the armistice. The details of the study cannot be reported here. On the whole the group averaged in mental ability the equivalent of the entire draft. The range of intelligence was approximately the same. Certain differences in mental capacity were apparently related to crimes of special sorts. Desertion correlated positively with low mentality though the correspondence was not high. The actual percentage of low grade mental cases increased with certain other army offenses. The preliminary nature of the study makes it unwise to quote extensively from the report.

The army tests have recently been used in surveys of state reformatories and state prisons. The argument states that the transfer of the mentally deficient to state institutions for the feeble-minded and defectives would relieve the prisons of persons who do not properly belong there, would reduce the expense of their care, and place them where they would not be turned loose again in a society where they cannot protect themselves. Thus a necessary first step would be taken in the solution of causes of crime by the classification of these men and women on the basis of intelligence.

The evidence so far does not indicate that the problem is solved by this classification. On the contrary it indicates rather definitely that other causes or facilitating conditions are largely responsible. The negative character of the evidence is important. Where positive correspondence of crime with

feeble-mindedness exists we can proceed at once with segregation. Classification by such progressive steps becomes easier as one after another of the causes are uncovered and removed.

The significance of mental tests is greater in the cases of prostitution studied. In several hundred cases investigated by the psychologists, 53 per cent of the women were ten years mental age or less; 10 per cent were so feeble-minded that they should have been placed in custodial institutions. These results correspond to previous results obtained in many parts of the country. A large percentage of those who tested above ten mentally showed marked evidence of mental instability and in some instances definite mental disease. A relatively small number could be said to be mentally normal.

Studies of conscientious objectors by means of the psychological examinations showed that they averaged slightly higher as a group than the draft. A few were foreign born, but the cause evidently must be sought elsewhere than in either of these conditions. The clannish nature of the groups that furnished the majority of the conscientious objectors has been suggested as the condition underlying their failure to appreciate the aims and ideals of the great mass of men and women. Whatever the cause or condition, it does not seem to lie in any difference of general mental ability. Again the evidence is negative, but one of the most common explanations, ignorance as evidenced in lack of mental capacity, can no longer be offered.

INDUSTRIAL APPLICATIONS

The following discussion is quoted in the main, from a manuscript by Major Yerkes.

The convincing demonstration of the practicability of mental measurement in connection with placement is one of the conspicuously important contributions of psychological service to the Army. It is generally admitted by those who have taken the trouble to consider the matter, that the methods prepared to meet military needs have wide applicability and possibility

of indefinitely increasing value. Within the Army, experienced officers as well as men new to the service recognize that the utilization of mental ratings has increased efficiency by improving placement and facilitating elimination. Psychological service has suddenly created a large demand for technological work. This demand is most insistent from education and industry; although the sciences also are making their needs known. Before the war mental engineering was a dream; to-day it exists, and its effective development is amply assured.

The relation of intelligence to occupation as studied in the Army is of very obvious importance for education and for industry. Figure 24 presents the proportion of the three chief groups of intelligence ratings for a number of army occupations. The data are not comparable with those which would be obtained from civilian groups because of various selectional factors which appear in the Army.

In order of diminishing intelligence the occupational groups represented in Figure 24 may be classified thus: professions, clerical occupations, trades, partially skilled labor and unskilled labor. The greatest differences in intelligence required or exhibited by different occupations appear at the ends of the scale, whereas differences in the trained group are relatively slight. Further differences in range of intelligence for the various occupations are considerable and probably significant. The range in general diminishes from unskilled labor to the intellectually difficult professions for the obvious reason that whereas any individual may attempt tasks which require relatively little intelligence or education, only able individuals can succeed in the learned professions. It is well worthy of remark that whereas the group of army laborers contains few individuals of high grade intelligence (A or B ratings), the group of engineering officers contains very few except high grade individuals.

Figure 25 presents the relation of intelligence to occupation for a similar group of army occupations but in quite different manner.

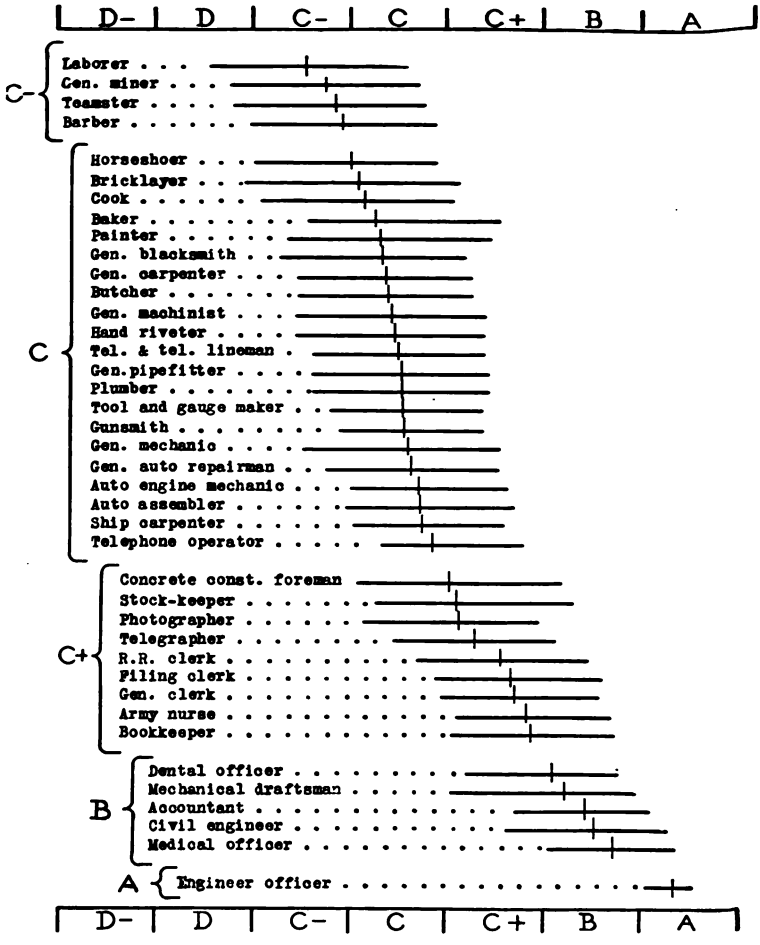


FIGURE 24.—Occupational intelligence standards. Based on data for 18,423 men. Data taken from soldiers' qualification cards. Length of bar shows range of middle 50 per cent. Vertical crossbar shows position of median.

The data sampled by Figures 24 and 25 suggest both the possibility and desirability of securing intelligence specifications for use in education and industry. Such specifications, if satis-

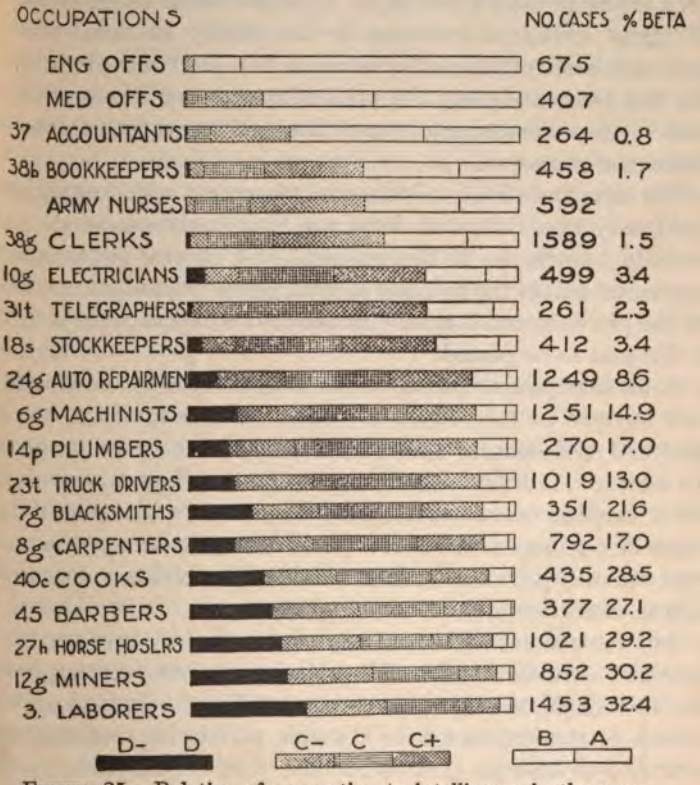


FIGURE 25.—Relation of occupation to intelligence in the army.

factorily prepared, should greatly assist teachers in advising and directing pupils in accordance, for example, with some such plan of educational organization as has been suggested above. They should also prove of value in connection with industrial placement.

Within the industrial sphere, as contrasted with educational,

intelligent employment management requires abundant information and the development and use of scientific methods. Individuals, if hired and placed at random, seldom hold their jobs for more than a few days. The enormous labor turnover of many industrial concerns is due chiefly to three causes: (a) the relative unfitness (by nature or training) of the individual for the work assigned, (b) unsatisfactory conditions of labor and (c) the mechanization and the resulting dehumanizing of industrial processes.

For wise and effective industrial placement and occupational guidance, two things at least are absolutely essential: first, definite knowledge of the physical and mental requirements (specification) of the job, and second, equally definite knowledge of the physical and mental characteristics and capacities of the individual to be placed.

If these requirements are to be met satisfactorily, occupations will have to be carefully analyzed in their relations to the individual and definite specifications will have to be prepared. In addition, individuals will have to be classified in accordance with intelligence, temperament, education and occupational taste or preference. It is now possible to prepare specifications and suitably to classify individuals with reference to intelligence, education and occupational taste.

For the present at least it is probable that if three grades of intellect were distinguished in industry, as has been suggested for the school, a very great gain would be made in degree of fitness of the individual for his task, and in his resulting content and efficiency.

Concerning temperamental measurement and classification, there is little to say, for methods at once simple and reliable are not yet available. It is nevertheless obvious that temperament is as important as intelligence for industrial placement and vocational guidance. Despite the seemingly infinite variety of temperaments, there are probably just a few classes which have great occupational importance. It is possible, indeed,

that even three classes, as in the case of intelligence, might suffice for immediate practical requirements, could we but devise methods of measuring temperamental characteristics as satisfactory as those now used for measuring intelligence.

The concrete significance of general intelligence testing is difficult to describe. It is conceivable that some occupation will show a perfect degree of correspondence between score and success. If such an occupation were ever found the application of the test to candidates for positions in that occupation would be seen to be the best measure possible. No one expects to find such an occupation. That correspondence between school success and the tests is relatively high is shown above. Clerical workers succeed in general in proportion to score; but many other factors are to be considered even in these cases of positive correlation.*

An illustration of a negative correlation or correspondence is given in the following table compiled from records of a group of machine operators. Here the correlation between production and the army test scores is —.087.

Distribution tables comparing score and errors and score and combined production and errors for this special group of operators give similar results. Two things are at once apparent. A number of girls are putting in their time on work at which they do not excel. Some of these have high intelligence scores, some have extremely low scores, but neither group is producing results comparable with those of a third group of girls whose intelligence is nearer the average for the entire group. In the second place the evidence points definitely to other factors than intelligence as important in determining the success of an operator.

In this instance the intelligence test may be said to have shown that certain girls are not doing work in which they excel.

* See an excellent discussion of the problem in an article by T. L. Kelley in *The Journal of Applied Psychology*, March, 1919, entitled "Principles Underlying the Classification of Men."

TABLE 13

Alpha Score

Number of plates cut	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
400																				
390					1															
380				1			1													
370																				
360					1															
350								1												
340																				
330							1													
320				1			1	1	1											
310						1					1									
300				1				1												
290				2	1	1		2												
280		1			2		1		1											
270				1		1		1			2									
260				2	1	2	1	3				1								
250				1	1	2		1		1										
240							3	1	2	1	1		1				1			
230						1	1		1	1	1									
220				1	1		2	2	1	1	1	1								
210					1	1	2	1		2										
200			1	1	1	3	2	5			1		1							
190	1				1								1							
180	1			1						1										
170							1													
160					1		1													
150					1			1			1									
140																				
130																				
120																				
110								1												
f	2	1	1	12	13	12	17	21	6	7	8	2	3	0	0	0	1	0	0	0

The problem of finding what they would excel in is, of course, untouched. The results also indicate the need for a more detailed analysis of the particular task.

The list of cautions in the use of tests is already a long one, but many more might be added. In this chapter certain fields that are open and ready for the intensive labor that accompanies research have been described briefly. The most dangerous thing that can happen is to have education, economics, sociology and industry accept the results of mental tests uncritically and with haste for immediate service that does not permit careful study and additional research. The army demonstration has proved conclusively the value of psychological investigations. But it established another idea equally important—the value of group coöperation.

The following quotation from Lieut. Commander Dodge emphasizes this point:

Value of Group Coöperation

"The list of incompleted services that were cut short of full fruition by the signing of the armistice would be too long to even mention here, though it would include some of the more difficult and important enterprises of psychological service.

"The most important facts that appeared in the war work of the psychologists were, first, the value of the applications of the principles of psychology to concrete military problems; and, second, the importance of coöperation in practical scientific service. To the military tasks the psychologists brought their appreciation of the distinctly human and mental aspects of the problems that were involved, their training in the technic of mental analysis, their laboratory methods for estimating human reactions, and their ingenuity in developing new instruments for special purposes.

"But in no case was the necessary skill and practical experience in the possession of any one person. The best work of the psychologists was the product of group coöperation for which

the far-sighted guidance of the chairman, Major R. M. Yerkes and his colleagues of the National Research Council was an important condition. Success in our undertakings would have been impossible without the will to coöperate with each other with representatives of the other sciences, with employment managers, industrial and educational experts, as well as with officers of the Army and Navy. While it was not always easy to convince responsible persons that we could help, when they were once convinced the only limit to our service was the limit of human endurance. At the end of the war, avenues were opening for genuine coöperation in scientific matters between the various scientific bodies of the Allies.

"At the conclusion of our war work two real dangers confront us, one military and the other social. The military danger is that with the passing of the military crisis we shall stop our study of the mental factors in war. If some other country with more permanent policies should take up the mental analyses where we have left them, and develop a real military psychology, they would have a military instrument vastly more effective than 42-cm. guns.

"But even if the efforts of our statesmen are successful and war is forever abolished, the relative importance of psychological offensives will not be diminished. On the contrary, when mental weapons become the only legitimate means for securing national ends they will become increasingly more important. Whether the reconstruction is military or non-military, the need of coöperative studies of vital mental problems and of coöperative efforts at scientific mental engineering will certainly not be less important for society than the scientific and engineering problems that concern material things. In view of these future needs, our war-time activities, however interesting, and however successful they may have been, seem relatively trivial and insignificant."

CHAPTER VI

ARMY TEST RECORD BLANKS AND FORMS

The different forms of the tests and other printed materials used in psychological examining in the army are reproduced in this chapter. The keys for the alpha forms have been placed after the rules for scoring, pp. 70–77. No key is given for test 1, since the paper is easily scored by referring to the directions or a key can be made on a separate copy of the page for test 1. Form 0 of beta, the only form used in the army, is reproduced with correct answers indicated where needed. Keys for these tests are also easily made.

Form 5 alpha and form 0 beta are reproduced original size. The separate tests in the alpha booklets were arranged so that test 1 came on the outside page as shown. Test 2 was on the right-hand inside page. Test 8 was placed upside down on the second or left-hand page of the booklet. Tests 3 and 4 followed test 2 on succeeding right-hand pages. From the back tests 5, 6, 7 and 8 came in order. This arrangement assisted in keeping the subject from looking ahead or correcting the previous test after time was called.

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

SAMPLES
1 How many are 5 men and 10 men?.....Answer (**15**)
2 If you walk 4 miles an hour for 3 hours, how far do you walk?..Answer (**12**)

1 How many are 30 men and 7 men?.....Answer (37)
2 If you save $7 a month for 4 months, how much will you save?.....Answer (28)
3 If 24 men are divided into squads of 8, how many squads will there be?.....Answer (3)
4 Mike had 12 cigars. He bought 3 more, and then smoked 6. How many cigars did he have left?.....Answer (9)
5 A company advanced 5 miles and retreated 3 miles. How far was it then from its first position?.....Answer (2)
6 How many hours will it take a truck to go 66 miles at the rate of 6 miles an hour?.....Answer (11)
7 How many cigars can you buy for 50 cents at the rate of 2 for 5 cents?.....Answer (20)
8 A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 8 miles. How many miles did they march the last day?.....Answer ( )

FORM
Name
Com
Ir
C

11 A dealer bought some mules for $800. He sold them for $1,000, making $40 on each mule. How many mules were there?.....Answer (5)

12 A rectangular bin holds 400 cubic feet of lime. If the bin is 10 feet long and 5 feet wide, how deep is it?.....Answer ( )

13 A recruit spent one-eighth of his spare change for post cards and four times as much for a box of letter paper, and then had 90 cents left. How much money did he have at first?.....Answer ( )

14 If 3½ tons of coal cost $21, what will 5½ tons cost?.....Answer ( )

15 A ship has provisions to last her crew of 500 men 6 months. How long would it last 1,200 men?.....Answer ( )

16 If a man runs a hundred yards in 10 seconds, how many feet does he run in a fifth of a second?.....Answer ( )

17 A U-boat makes 8 miles an hour under water and 15 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go two-fifths of the way under water?.....Answer ( )

18 If 241 squads of men are to dig 4,097 yards of trench, how many yards must be dug by each squad?.....Answer ( )

19 A certain division contains 3,000 artillery, 15,000 infantry and 1,000 cavalry. If each branch is expanded proportionately until there are in all 20,900 men, how many will be added to the artillery?.....Answer ( )

20 A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 29 mess halls. Of this remainder each mess hall received 54 barrels. What was the total number of barrels supplied?.....Answer ( )

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE

Why do we use stoves? Because
- ☐ they look well
- ☒ they keep us warm
- ☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

---

1 Cats are useful animals, because
- ☒ they catch mice
- ☐ they are gentle
- ☐ they are afraid of dogs

2 Why are pencils more commonly carried than fountain pens? Because
- ☐ they are brightly colored
- ☒ they are cheaper
- ☐ they are not so heavy

3 Why is leather used for shoes? Because
- ☐ it is produced in all countries
- ☒ it wears well
- ☐ it is an animal product

4 Why judge a man by what he does rather than by what he says? Because
- ☒ what a man does shows what he really is
- ☐ it is wrong to tell a lie
- ☒ a deaf man cannot hear what is said

5 If you were asked what you *thought* of a person whom you didn't know, what should you say?
- ☐ I will go and get acquainted
- ☐ I think he is all right
- ☒ I don't know him and can't say

6 Streets are sprinkled in summer
- ☐ to make the air cooler
- ☒ to keep automobiles from skidding
- ☒ to keep down dust

7 Why is wheat better for food than corn? Because
- ☒ it is more nutritious
- ☒ it is more expensive
- ☒ it can be ground finer

8 If a man made a million dollars, he ought to
- ☐ pay off the national debt
- ☒ contribute to various worthy charities
- ☐ give it all to some poor man

☞ Go to No. 9

9 Why do many persons prefer automobiles to street cars? Because
- ☐ an auto is made of higher grade materials
- ☒ an automobile is more convenient
- ☐ street cars are not as safe

10 The feathers on a bird's wings help him to fly because they
- ☒ make a wide, light surface
- ☐ keep the air off his body
- ☐ keep the wings from cooling off too fast

11 All traffic going one way keeps to the same side of the street because
- ☐ most people are right handed
- ☐ the traffic policeman insists on it
- ☒ it avoids confusion and collisions

12 Why do inventors patent their inventions? Because
- ☒ it gives them control of their inventions
- ☐ it creates a greater demand
- ☐ it is the custom to get patents

☞ Go to No. 13 above

13 Freezing water bursts pipes because
- ☐ cold makes the pipes weaker
- ☒ water expands when it freezes
- ☐ the ice stops the flow of water

14 Why are high mountains covered with snow? Because
- ☐ they are near the clouds
- ☐ the sun seldom shines on them
- ☒ the air is cold there

15 If the earth were nearer the sun
- ☐ the stars would disappear
- ☐ our months would be longer
- ☒ the earth would be warmer

16 Why is it colder nearer the poles than near the equator? Because
- ☐ the poles are always farther from the sun
- ☒ the sunshine falls obliquely at the poles
- ☐ there is more ice at the poles

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
	lions strong are	true	false	1
1	houses people in live	true	false	2
2	days there in are week eight a	true	false	3
3	leg flies one have only	true	false	4
4	months coldest are summer the	true	false	5
5	gotten sea water sugar is from	true	false	6
6	honey bees flowers gather the from	true	false	7
7	and eat good gold silver to are	true	false	8
8	president Columbus first the was America of	true	false	9
9	making is bread valuable wheat for	true	false	10
10	water and made are butter from cheese	true	false	11

18	adapt—conform	same—opposite	18
19	debase—exalt	same—opposite	19
20	dissension—harmony	same—opposite	20
21	repress—restrain	same—opposite	21
22	bestow—confer	same—opposite	22
23	amenable—tractable	same—opposite	23
24	avert—prevent	same—opposite	24
25	reverence—veneration	same—opposite	25
26	fallacy—verity	same—opposite	26
27	specific—general	same—opposite	27
28	pompous—ostentatious	same—opposite	28
29	accumulate—dissipate	same—opposite	29
30	apathy—indifference	same—opposite	30
31	effeminate—virile	same—opposite	31
32	peculation—embezzlement	same—opposite	32
33	benign—genial	same—opposite	33
34	acme—climax	same—opposite	34
35	largess—donation	same—opposite	35
36	innuendo—insinuation	same—opposite	36
37	vesper—matin	same—opposite	37
38	aphorism—maxim	same—opposite	38
39	abjure—renounce	same—opposite	39
40	encomium—eulogy	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false
	horses feathers have all	true	false
1	lions strong are	true	false
2	houses people in live	true	false
3	days there in are week eight a	true	false
4	leg flies one have only	true	false
5	months coldest are summer the	true	false
6	gotten sea water sugar is from	true	false
7	honey bees flowers gather the from	true	false
8	and eat good gold silver to are	true	false
9	president Columbus first the was America of	true	false
10	making is bread valuable wheat for	true	false
11	water and made are butter from cheese	true	false

12	sides every has four triangle	true	false	12
13	every times makes mistakes person at	true	false	13
14	many toes fingers as men as have	true	false	14
15	not eat gunpowder to good is	true	false	15
16	ninety canal ago built Panama years was the	true	false	16
17	live dangerous is near a volcano to it	true	false	17
18	clothing worthless are for and wool cotton	true	false	18
19	as sheets are napkins used never	true	false	19
20	people trusted intemperate be always can	true	false	20
21	employ debaters irony never	true	false	21
22	certain some death of mean kinds sickness	true	false	22
23	envy bad malice traits are and	true	false	23
24	repeated call human for courtesies associations	true	false	24

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
1	lions strong are	true	false	1
2	houses people in live	true	false	2
3	days there in are week eight a	true	false	3
4	leg flies one have only	true	false	4
5	months coldest are summer the	true	false	5
6	gotten sea water sugar is from	true	false	6
7	honey bees flowers gather the from	true	false	7
8	and eat good gold silver to are	true	false	8
9	president Columbus first the was America of	true	false	9
10	making is bread valuable wheat for	true	false	10
11	water and made are butter from cheese	true	false	11

TEST 7

SAMPLES
sky—blue : : grass— table **green** warm big
fish—swims : : man— paper time **walks** girl
day—night : : white— red **black** clear pure

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	gun—shoots : : knife— run **cuts** hat bird	1
2	ear—hear : : eye— table **hand** see play	2
3	dress—woman : : feathers— **bird** neck feet bill	3
4	handle—hammer : : knob— key room shut **door**	4
5	shoe—foot : : hat— coat nose **head** collar	5
6	water—drink : : bread— cake coffee **eat** pie	6
7	food—man : : gasoline— gas oil automobile **spark**	7
8	eat—fat : : starve— **thin** food bread thirsty	8
9	man—home : : bird— **fly** insect worm nest	9
10	go—come : : sell— **leave** buy money papers	10
11	peninsula—land : : bay— **boats** pay ocean Massachusetts	11
12	hour—minute : : minute— man week **second** short	12
13	abide—depart : : stay— over home play **leave**	13
14	January—February : : June— **July** May month year	14
15	bold—timid : : advance— **proceed** **retreat** campaign soldier	15

TEST 7

SAMPLES
- sky—blue : : grass— table **green** warm big
- fish—swims : : man— paper time **walks** girl
- day—night : : white— red **black** clear pure

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	gun—shoots : : knife— run **cuts** hat bird	1
2	ear—hear : : eye— table **hand** **see** play	2
3	dress—woman : : feathers— **bird** neck feet bill	3
4	handle—hammer : : knob— key room shut **door**	4
5	shoe—foot : : hat— coat nose **head** collar	5
6	water—drink : : bread— cake coffee **eat** pie	6
7	food—man : : gasoline— gas oil **automobile** spark	7
8	eat—fat : : starve— **thin** food bread thirsty	8
9	man—home : : bird— fly insect worm **nest**	9
10	go—come : : sell— leave **buy** money papers	10
11	peninsula—land : : bay— boats pay ocean Massachusetts	11
12	hour—minute : : minute— man week **second** short	12
13	abide—depart : : stay— over home play **leave**	13
14	January—February : : June— **July** May month year	14
15	bold—timid : : advance— proceed retreat campaign soldier	15

16 above—below : : top— spin bottom surface side 16
17 lion—animal : : rose— smell leaf plant thorn 17
18 tiger—carnivorous : : horse— cow pony buggy herbivorous 18
19 sailor—navy : : soldier— gun cap hill army 19
20 picture—see : : sound— noise music hear bark 20

21 success—joy : : failure— sadness success fail work 21
22 hope—despair : : happiness— frolic fun joy sadness 22
23 pretty—ugly : : attract— fine repel nice draw 23
24 pupil—teacher : : child— parent doll youngster obey 24
25 city—mayor : : army— navy soldier general private 25

26 establish—begin : : abolish— slavery wrong abolition end 26
27 December—January : : last— least worst month first 27
28 giant—dwarf : : large— big monster queer small 28
29 engine—caboose : : beginning— commence cabin end train 29
30 dismal—cheerful : : dark— sad stars night bright 30

31 quarrel—enemy : : agree— friend disagree agreeable foe 31
32 razor—sharp : : hoe— bury dull cuts tree 32
33 winter—summer : : cold— freeze warm wet January 33
34 rudder—ship : : tail— sail bird dog cat 34
35 granary—wheat : : library— desk books paper librarian 35

36 tolerate—pain : : welcome— pleasure unwelcome friends give 36
37 sand—glass : : clay— stone hay bricks dirt 37
38 moon—earth : : earth— ground Mars sun sky 38
39 tears—sorrow : : laughter— joy smile girls grin 39
40 cold—ice : : heat— lightning warm steam coat 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes** **ears** **nose** **mouth**

The correct word is **ears**, because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
People **hear** with the **eyes** **ears** **nose** **mouth**
France is in **Europe** **Asia** **Africa** **Australia**

1 **America** was discovered by **Drake** **Hudson** **Columbus** **Balboa** 1
2 **Pinochle** is played with **rackets** **cards** **pins** **dice** 2
3 The most prominent industry of **Detroit** is **automobiles** **brewing** **flour** **packing** ... 3
4 The **Wyandotte** is a kind of **horse** **fowl** **cattle** **granite** 4
5 The **U. S. School for Army Officers** is at **Annapolis** **West Point** **New Haven** **Ithaca** 5
6 **Food products** are made by **Smith & Wesson** **Swift & Co.** **W. L. Douglas** **B. T. Babbitt** 6
7 **Bud Fisher** is famous as an **actor** **author** **baseball player** **comic artist** 7
8 The **Guernsey** is a kind of **horse** **goat** **sheep** **cow** 8
9 **Marguerite Clark** is known as a **suffragist** **singer** **movie actress** **writer** 9
10 **"Hasn't scratched yet"** is used in advertising a **duster** **flour** **brush** **cleanser** 10
11 **Salsify** is a kind of **snake** **fish** **lizard** **vegetable** 11
12 **Coral** is obtained from **mines** **elephants** **oysters** **reefs** 12
13 **Rosa Bonheur** is famous as a **poet** **painter** **composer** **sculptor** 13
14 The **tuna** is a kind of **fish** **bird** **reptile** **insect** 14
15 **Emeralds** are usually **red** **blue** **green** **yellow** 15

16 **Maize** is a kind of **corn hay oats rice** 16
17 **Nabisco** is a **patent medicine disinfectant food product tooth paste** 17
18 **Velvet Joe** appears in advertisements of **tooth powder dry goods tobacco soap** ... 18
19 **Cypress** is a kind of **machine food tree fabric** 19
20 **Bombay** is a city in **China Egypt India Japan** 20

21 The **dictaphone** is a kind of **typewriter multigraph phonograph adding machine** .. 21
22 The **pancreas** is in the **abdomen head shoulder neck** 22
23 **Cheviot** is the name of a **fabric drink dance food** 23
24 **Larceny** is a term used in **medicine theology law pedagogy** 24
25 The **Battle of Gettysburg** was fought in **1863 1813 1778 1812** 25

26 The **bassoon** is used in **music stenography book-binding lithography** 26
27 **Turpentine** comes from **petroleum ore hides trees** 27
28 The number of a **Zulu's legs** is **two four six eight** 28
29 The **scimitar** is a kind of **musket cannon pistol sword** 29
30 The **Knight engine** is used in the **Packard Lozier Stearns Pierce Arrow** 30

31 The author of **" The Raven "** is **Stevenson Kipling Hawthorne Poe** 31
32 **Spare** is a term used in **bowling football tennis hockey** 32
33 A **six-sided figure** is called a **scholium parallelogram hexagon trapezium** 33
34 **Isaac Pitman** was most famous in **physics shorthand railroading electricity** 34
35 The **ampere** is used in measuring **wind power electricity water power rainfall** 35

36 The **Overland car** is made in **Buffalo Detroit Flint Toledo** 36
37 **Mauve** is the name of a **drink color fabric food** 37
38 The **stanchion** is used in **fishing hunting farming motoring** 38
39 **Mica** is a **vegetable mineral gas liquid** 39
40 **Scrooge** appears in **Vanity Fair The Christmas Carol Romola Henry IV** 40

Form 6. Group Examination Alpha

(Test 1 is the same as for Form 5, following page 204)

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

SAMPLES 1	How many are 5 men and 10 men? ..... Answer (	**15**	)
SAMPLES 2	If you walk 4 miles an hour for 3 hours, how far do you walk? .. Answer (	**12**	)
1	How many are 40 guns and 6 guns? ..... Answer (		)
2	If you save $6 a month for 5 months, how much will you save? ..... Answer (		)
3	If 32 men are divided into squads of 8, how many squads will there be? .... Answer (		)
4	Mike had 11 cigars. He bought 3 more and then smoked 6. How many cigars did he have left? ..... Answer (		)
5	A company advanced 6 miles and retreated 3 miles. How far was it then from its first position? ..... Answer (		)
6	How many hours will it take a truck to go 48 miles at the rate of 4 miles an hour? ..... Answer (		)
7	How many pencils can you buy for 40 cents at the rate of 2 for 5 cents? .... Answer (		)
8	A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 9 miles. How many miles did they march the last day? ..... Answer (		)
9	If you buy 2 packages of tobacco at 8 cents each and a pipe for 55 cents, how much change should you get from a two-dollar bill? ..... Answer (		)
10	If it takes 8 men 2 days to dig a 160-foot drain, how many men are needed to dig it in half a day? ..... Answer (		)

11 A dealer bought some mules for $900. He sold them for $1,000, making $25 on each mule. How many mules were there?.....Answer ( )

12 A rectangular bin holds 600 cubic feet of lime. If the bin is 10 feet wide and 5 feet deep, how long is it?.....Answer ( )

13 A recruit spent one-eighth of his spare change for post cards and four times as much for a box of letter paper, and then had 60 cents left. How much money did he have at first?.....Answer ( )

14 If 2½ tons of hay cost $20, what will 4½ tons cost?.....Answer ( )

15 A ship has provisions to last her crew of 600 men 6 months. How long would it last 800 men?.....Answer ( )

16 If a train goes 200 yards in 10 seconds, how many **feet** does it go in a fifth of a second?.....Answer ( )

17 A U-boat makes 10 miles an hour under water and 20 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go three-fifths of the way under water?.....Answer ( )

18 If 214 squads of men are to dig 4,066 yards of trench, how many yards must be dug by each squad?.....Answer ( )

19 A certain division contains 2,000 artillery, 15,000 infantry, and 1,000 cavalry. If each branch is expanded proportionately until there are in all 19,800 men, how many will be added to the artillery?.....Answer ( )

20 A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 28 mess halls. Of this remainder each mess hall received 47 barrels. What was the total number of barrels supplied?.....Answer ( )

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE
Why do we use stoves? Because
☐ they look well
☒ they keep us warm
☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 If plants are dying for lack of rain, you should
☐ water them
☐ ask a florist's advice
☐ put fertilizer around them

2 A house is better than a tent, because
☐ it costs more
☐ it is more comfortable
☐ it is made of wood

3 Why does it pay to get a good education? Because
☐ it makes a man more useful and happy
☐ it makes work for teachers
☐ it makes demand for buildings for schools and colleges

4 If the grocer should give you too much money in making change, what is the right thing to do?
☐ buy some candy of him with it
☐ give it to the first poor man you meet
☐ tell him of his mistake

5 Why should food be chewed before swallowing?
☐ it is better for the health
☐ it is bad manners to swallow without chewing
☐ chewing keeps the teeth in condition

6 If you saw a train approaching a broken track you should
☐ telephone for an ambulance
☐ signal the engineer to stop the train
☐ look for a piece of rail to fit in

7 If you are lost in a forest in the daytime, what is the thing to do?
☐ hurry to the nearest house you know of
☐ look for something to eat

☐ use the sun or a compass for a guide

8 It is better to fight than to run, because
- ☐ cowards are shot
- ☐ it is more honorable
- ☐ if you run you may get shot in the back

9 Why are warships painted gray? Because gray paint
- ☐ is cheaper than other colors
- ☐ is more durable than other colors
- ☐ makes the ships harder to see

10 Why should all parents be made to send their children to school? Because
- ☐ it prepares them for adult life
- ☐ it keeps them out of mischief
- ☐ they are too young to work

11 The reason that many birds sing in the spring is
- ☐ to let us know spring is here
- ☐ to attract their mates
- ☐ to exercise their voices

12 Gold is more suitable than iron for making money because
- ☐ gold is pretty
- ☐ iron rusts easily
- ☐ gold is scarcer and more valuable

13 The cause of echoes is
- ☐ the reflection of sound waves
- ☐ the presence of electricity in the air
- ☐ the presence of moisture in the air

14 We see no stars at noon because
- ☐ they have moved around to the other side of the earth
- ☐ they are so much fainter than the sun
- ☐ they are hidden behind the sky

15 Some men lose their breath on high mountains because
- ☐ the wind blows their breath away
- ☐ the air is too rare
- ☐ it is always cold there

16 Why do some men who could afford to own a house live in a rented one? Because
- ☐ they don't have to pay taxes
- ☐ they don't have to buy a rented house
- ☐ they can make more by investing the money the house would cost

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
good—bad.....same—opposite
little—small.....same—opposite

1	cold—hot	same—opposite	1
2	long—short	same—opposite	2
3	bare—naked	same—opposite	3
4	joy—happiness	same—opposite	4
5	find—lose	same—opposite	5
6	shrill—sharp	same—opposite	6
7	minus—plus	same—opposite	7
8	grim—stern	same—opposite	8
9	careless—anxious	same—opposite	9
10	crude—coarse	same—opposite	10
11	commend—approve	same—opposite	11
12	linger—loiter	same—opposite	12
13	agony—bliss	same—opposite	13
14	defective—normal	same—opposite	14
15	competent—qualified	same—opposite	15

16	knave—villain	same—opposite	16
17	null—void	same—opposite	17
18	wax—wane	same—opposite	18
19	adversary—colleague	same—opposite	19
20	altruistic—egotistic	same—opposite	20
21	furtive—sly	same—opposite	21
22	any—none	same—opposite	22
23	asunder—apart	same—opposite	23
24	deplete—exhaust	same—opposite	24
25	superfluous—essential	same—opposite	25
26	recoup—recover	same—opposite	26
27	celibate—married	same—opposite	27
28	recant—disavow	same—opposite	28
29	avarice—cupidity	same—opposite	29
30	aggrandize—belittle	same—opposite	30
31	decadence—decline	same—opposite	31
32	nullify—annul	same—opposite	32
33	ambiguous—equivocal	same—opposite	33
34	agglomerate—scatter	same—opposite	34
35	plenary—complete	same—opposite	35
36	suavity—asperity	same—opposite	36
37	perfunctory—meticulous	same—opposite	37
38	lugubrious—maudlin	same—opposite	38
39	desuetude—disuse	same—opposite	39
40	adventitious—accidental	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
1	cows milk give	true	false	1
2	write are with to pencils	true	false	2
3	are and apples long thin	true	false	3
4	east the in rises sun the	true	false	4
5	months warmest are summer the	true	false	5
6	wood made carpets are of always	true	false	6
7	known elephant animal an is smallest the	true	false	7
8	water cork on float will not	true	false	8
9	vote children 21 cannot under	true	false	9
10	battleships on seldom sails used are	true	false	10
11	four hundred all pages contain books	true	false	11

12	iron paper made of is filings	true	false	12
13	pays cautious it be to often	true	false	13
14	a general not major a and rank same the of are	true	false	14
15	Washington canal 1776 Panama the in built	true	false	15
16	never deeds rewarded be should good	true	false	16
17	will live bird no forever	true	false	17
18	gases the in Mohawks fighting used poisonous	true	false	18
19	friends in us disaster often false desert	true	false	19
20	external deceptive never appearances are	true	false	20
21	size now of guns use are great in	true	false	21
22	happiness lists great casualty cause	true	false	22
23	always sleeplessness clear causes a conscience	true	false	23
24	inflict men pain needless cruel sometimes	true	false	24

TEST 6

SAMPLES	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

2	3	4	5	6	7	.....	.....
5	10	15	20	25	30	.....	.....
10	9	8	7	6	5	.....	.....
6	9	12	15	18	21	.....	.....
8	8	6	6	4	4	.....	.....
3	7	11	15	19	23	.....	.....
9	1	7	1	5	1	.....	.....
25	25	21	21	17	17	.....	.....
4	5	8	9	12	13	.....	.....
21	18	16	13	11	8	.....	.....
1	2	4	8	16	32	.....	.....
3	4	6	9	13	18	.....	.....
12	14	13	15	14	16	.....	.....
25	24	22	21	19	18	.....	.....
16	12	15	11	14	10	.....	.....

16	8	4	2	1	½				
15	16	14	17	13	18				
1	4	9	16	25	36				
21	18	16	15	12	10				
4	8	10	20	22	44				

TEST 7

SAMPLES
sky—blue : : grass— **table** **green** **warm** **big**
fish—swims : : man— **paper** **time** **walks** **girl**
day—night : : white— **red** **black** **clear** **pure**

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	dog—bark : : cat— **chair** **mew** **fire** **house**	1
2	foot—man : : hoof— **corn** **tree** **cow** **hoe**	2
3	dog—puppy : : cat— **kitten** **dog** **tiger** **horse**	3
4	wash—face : : sweep— **clean** **broom** **floor** **straw**	4
5	door—house : : gate— **swing** **hinges** **yard** **latch**	5
6	water—fish : : air— **spark** **man** **blame** **breathe**	6
7	white—black : : good— **time** **clothes** **mother** **bad**	7
8	boy—man : : lamb— **sheep** **dog** **shepherd** **wool**	8
9	roof—house : : hat— **button** **shoe** **straw** **head**	9
10	camp—safe : : battle— **win** **dangerous** **field** **fight**	10
11	straw—hat : : leather— **shoe** **bark** **coat** **soft**	11
12	pan—tin : : table— **chair** **wood** **legs** **dishes**	12
13	left—right : : west— **south** **direction** **east** **north**	13
14	floor—ceiling : : ground— **earth** **sky** **hill** **grass**	14
15	cold—ice : : heat— **wet** **cold** **steam** **stars**	15

16 hat—head : : thimble— **sew cloth finger hand** *16*
17 Monday—Tuesday : : Friday— **week Thursday day Saturday**..... 17
18 lead—bullet : : gold— **paper coin silver copper**..... 18
19 skin—body : : bark— **tree dog bite leaf**..... 19
20 cannon—large : : rifle— **ball small bore shoot**..... 20

21 cellar—attic : : bottom— **well tub top house**..... 21
22 man—arm : : tree— **shrub limb flower bark**..... 22
23 suitcase—clothing : : purse— **purchase money string stolen**..... 23
24 knitting—girls : : carpentry— **trade houses boys lumber**..... 24
25 arteries—body : : railroads— **country train crossing accident**..... 25

26 ocean—pond : : deep— **sea well shallow steep**..... 26
27 revolver—man : : sting— **gun hurt bee hand**..... 27
28 engineer—chauffeur : : locomotive— **iron stack engine auto**..... 28
29 terrier—dog : : Jersey— **City cow horse State**..... 29
30 airplane—air : : submarine— **dive engine ship water**..... 30

31 esteem—friends : : despise— **forsake detest enemies people**..... 31
32 hospital—patient : : prison— **cell criminal bar jail**..... 32
33 tears—laughter : : sorrow— **joy distress funeral sad**..... 33
34 yes—no : : affirmative— **win debate deny negative**..... 34
35 establish—abolish : : begin— **work year end commence**..... 35

36 order—confusion : : peace— **part treaty war enemy**..... 36
37 education—ignorance : : wealth— **poverty riches health comfort**.... 37
38 10—100 : : 1000— **money 10000 20000 wealth**..... 38
39 imitate—copy : : invent— **study Edison machine originate**..... 39
40 historian—facts : : novelist— **fiction Dickens writer book**..... 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes** **ears** **nose** **mouth**

The correct word is **ears,** because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
People **hear** with the **eyes** **ears** **nose** **mouth**
France is in **Europe** **Asia** **Africa** **Australia**

1 **Boston** is in **Connecticut** **Rhode Island** **Maine** **Massachusetts** 1
2 **Euchre** is played with **dice** **rackets** **cards** **pins** 2
3 The **Arabian** is a kind of **horse** **goat** **cow** **sheep** 3
4 The most prominent industry of **Milwaukee** is **fish** **brewing** **flour** **automobiles** ... 4
5 **Turquoise** is usually **yellow** **red** **green** **blue** 5
6 The **Leghorn** is a kind of **cow** **horse** **fowl** **granite** 6
7 **Arthur Brisbane** is famous as a **newspaper man** **comic artist** **athlete** **actor** 7
8 **Shoes** are made by **Swift & Co.** **Smith & Wesson** **W. L. Douglas** **Babbitt Co.** 8
9 **Blanche Sweet** is known as a **writer** **singer** **suffragist** **movie actress** 9
10 **" The makings of a nation "** is an advertisement of a **tobacco** **flour** **beer** **health food.** 10
11 **Country Gentleman** is a kind of **wheat** **corn** **hay** **oats** 11
12 The **artichoke** is a **vegetable** **fish** **lizard** **snake** 12
13 **Yale University** is at **New Haven** **Annapolis** **Ithaca** **Cambridge** 13
14 **Tokio** is a city of **India** **China** **Egypt** **Japan** 14
15 **Diamonds** are obtained from **mines** **reefs** **elephants** **oysters** 15

16 **Rodin** is famous as a **poet painter sculptor composer** 16
17 The **chameleon** is a **bird reptile insect fish** 17
18 The **thyroid** is in the **shoulder neck head abdomen** 18
19 **Dioxygen** is a **disinfectant food product patent medicine tooth paste** 19
20 The **U. S. S. Michigan** is a **destroyer monitor submarine battleship** 20

21 The **cutlass** is a kind of **sword musket cannon pistol** 21
22 The **Corona** is a kind of **phonograph multigraph adding machine typewriter** 22
23 **Indigo** is a **food drink color fabric** 23
24 The **xylophone** is used in **lithography music stenography book-binding** 24
25 **Madras** is a **drink fabric food dance** 25

26 The author of "**The Scarlet Letter**" is **Hawthorne Poe Stevenson Kipling** 26
27 **John Wesley** was most famous in **literature science war religion** 27
28 The **Delco System** is used in **plumbing filing ignition cataloguing** 28
29 **Rubber** is obtained from **ore petroleum trees hides** 29
30 **Darwin** was most famous in **literature science war politics** 30

31 **Falstaff** appears in **Romola Vanity Fair Oliver Twist Henry IV** 31
32 The number of a **Korean's** legs is **two four six eight** 32
33 **Perjury** is a term used in **pedagogy law theology medicine** 33
34 A **tedder** is used in **farming fishing hunting athletics** 34
35 **Slice** is a term used in **bowling golf tennis football** 35

36 The **Battle of Lexington** was fought in **1620 1775 1812 1864** 36
37 The **kilowatt** is used in measuring **rainfall wind power electricity water power** ... 37
38 The **Buick car** is made in **Toledo Flint Buffalo Detroit** 38
39 Among the **allies of Germany** is **Bulgaria Norway Rumania Portugal** 39
40 An **eight-sided figure** is called a **trapezium scholium parallelogram octagon** 40

Form 7. Group Examination Alpha

(Test 1 is the same as for Form 5, following page 204)

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

SAMPLES
1 How many are 5 men and 10 men? ..... Answer (**15**)
2 If you walk 4 miles an hour for 3 hours, how far do you walk? Answer (**12**)

1 How many are 50 tents and 8 tents? ..... Answer ( )
2 If you save $5 a month for 7 months, how much will you save? ..... Answer ( )
3 If 40 men are divided into squads of 8, how many squads will there be? ... Answer ( )
4 Mike had 12 cigars. He bought 2 more and then smoked 7. How many cigars did he have left? ..... Answer ( )
5 A company advanced 7 miles and retreated 2 miles. How far was it then from its first position? ..... Answer ( )
6 How many hours will it take a truck to go 65 miles at the rate of 5 miles an hour? ..... Answer ( )
7 How many pencils can you buy for 30 cents at the rate of 2 for 5 cents? ... Answer ( )
8 A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 11 miles. How many miles did they march the last day? ..... Answer ( )
9 If you buy 2 packages of tobacco at 7 cents each and a pipe for 55 cents, how much change should you get from a two-dollar bill? ..... Answer ( )
10 If it takes 7 men 2 days to dig a 140-foot drain, how many men are needed to dig it in half a day? ..... Answer ( )

11 A dealer bought some mules for $1,000. He sold them for $1,200, making $20 on each mule. How many mules were there?.....Answer ( )

12 A rectangular bin holds 300 cubic feet of lime. If the bin is 10 feet long and 5 feet wide, how deep is it?.....Answer (6)

13 A recruit spent one-eighth of his spare change for post cards and four times as much for a box of letter paper, and then had 30 cents left. How much money did he have at first?.....Answer ( )

14 If 4½ tons of clover cost $36, what will 2½ tons cost?.....Answer (20)

15 A ship has provisions to last her crew of 800 men 4 months. How long would it last 1,200 men?.....Answer ( )

16 If a train goes 150 yards in 10 seconds, how many feet does it go in a fifth of a second?.....Answer ( )

17 A U-boat goes 10 miles an hour under water and 20 miles an hour on the surface. How long will it take to cross a 100-mile channel if it has to go one-fifth of the way under water?.....Answer ( )

18 If 341 squads of men are to dig 6,138 yards of trench, how many yards must be dug by each squad?.....Answer ( )

19 A certain division contains 4,000 artillery, 15,000 infantry, and 1,000 cavalry. If each branch is expanded proportionately until there are in all 22,000 men, how many will be added to the artillery?.....Answer ( )

20 A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 27 mess halls. Of this remainder each mess hall received 56 barrels. What was the total number of barrels supplied?.....Answer ( )

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE
Why do we use stoves? Because
☐ they look well
☒ they keep us warm
☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

---

1 Why are chairs made of wood? Because
☐ wood is cheap and light
☐ wood burns
☐ wood is easily broken

2 If a person asks you for something you do not have
☐ tell him to mind his business
☐ say you don't have it
☐ walk away

3 If it rains when you are starting to go for the doctor, what should you do?
☐ stay at home
☐ take an umbrella
☐ wait until it stops raining

4 If you are in danger of sunstroke what should you do?
☐ take off your shoes
☐ run to the hospital
☐ get in the shade or wet your head

5 If you find a man who has hanged himself, you should
☐ send a notice to the paper
☐ take him home
☐ call a doctor or the police

6 Why is tennis good exercise? Because
☐ it calls for vigorous movement
☐ it demands clear eyes
☐ it is very exciting

7 If while on the march you get bitten by a rattlesnake, you should
☐ kill the snake
☐ suck the poison from the wound
☐ run back to camp and get some whiskey

8 If you are hurrying in an auto to catch a train and come to a broken bridge, what should you do?
☐ go around and try another road

- ☐ take off your clothes and swim across
- ☐ hire a horse and ride across

9 Why do some people think that short men should be admitted to the army? Because
- ☐ usefulness does not depend on height
- ☐ they want to enlist
- ☐ they are more intelligent than tall men

10 If you find a lost 2-year-old baby on a city street, what should you do?
- ☐ ask him where he lives and take him there
- ☐ if he is a nice child take him home and keep him
- ☐ ask the police to help you or leave him with them

11 Electric lights are better than gas lights because electricity
- ☐ makes a white light
- ☐ is safer and more convenient
- ☐ is cheaper

12 Why is a check better than real money? Because
- ☐ checks are cleaner than bills
- ☐ you can have all the money you need by writing checks
- ☐ checks are safer and more convenient

13 Five P.M. is the rush hour on street cars because
- ☐ work people are going home at that hour
- ☐ so many people live in the suburbs
- ☐ street cars are the best cheap means of transportation

14 Why should people not waste food in time of war?
- ☐ we could eat less and not starve
- ☐ food is scarce in wartime
- ☐ food costs money

15 You should not give money to beggars on the street because
- ☐ it makes it hard for the beggars to get work
- ☐ it takes away the work of organized charities
- ☐ it encourages living off others

16 A country should have many railroads, because
- ☐ they decrease the price of food materials
- ☐ they make it easy to travel and carry goods
- ☐ they are good for the steel business

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you cannot be sure, guess. The two samples are already marked as they should be.

SAMPLES	good—bad	same—opposite	
	little—small	same—opposite	
1	white—black	same—opposite	1
2	cry—laugh	same—opposite	2
3	flat—level	same—opposite	3
4	heaven—hell	same—opposite	4
5	accept—take	same—opposite	5
6	slim—slender	same—opposite	6
7	asleep—awake	same—opposite	7
8	comfort—console	same—opposite	8
9	pigmy—dwarf	same—opposite	9
10	beg—entreat	same—opposite	10
11	concede—deny	same—opposite	11
12	cautious—heedless	same—opposite	12
13	congregate—assemble	same—opposite	13
14	contradict—confirm	same—opposite	14
15	appeal—beseech	same—opposite	15

16	legible—readable	same—opposite	16
17	amiable—surly	same—opposite	17
18	cleave—split	same—opposite	18
19	convoke—dismiss	same—opposite	19
20	docile—refractory	same—opposite	20
21	dearth—scarcity	same—opposite	21
22	besmirch—cleanse	same—opposite	22
23	hoax—deception	same—opposite	23
24	colleague—adversary	same—opposite	24
25	irksome—refreshing	same—opposite	25
26	lucrative—profitable	same—opposite	26
27	momentous—immaterial	same—opposite	27
28	contingent—dependent	same—opposite	28
29	indict—arraign	same—opposite	29
30	prefix—append	same—opposite	30
31	essential—fundamental	same—opposite	31
32	ligature—band	same—opposite	32
33	myopia—hyperopia	same—opposite	33
34	motile—sessile	same—opposite	34
35	amenable—tractable	same—opposite	35
36	diatribe—invective	same—opposite	36
37	obdurate—stubborn	same—opposite	37
38	profligate—ascetic	same—opposite	38
39	preamble—peroration	same—opposite	39
40	pertinacious—obstinate	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order: ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each would say if the words were straightened out, but don't write them yourself. Then, if what it would say is true, draw a line under the word "true"; if what it would say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
1	dogs meat eat	true	false	1
2	see are with to eyes	true	false	2
3	trees the fish in swim	true	false	3
4	harness paper of made is	true	false	4
5	money marry always for men	true	false	5
6	hump camel has a his a back on	true	false	6
7	flag the English same the as is the American	true	false	7
8	and cows from honey come bread	true	false	8
9	young nurse their cats	true	false	9
10	earth is mined coal the from	true	false	10

11	property floods life and destroy	true	false	11
12	grow and apples ground oranges the in	true	false	12
13	time in soldiers war trees in sleep	true	false	13
14	of Congress laws the makes our nation	true	false	14
15	true bought cannot friendship be	true	false	15
16	temperatures freezes water high at	true	false	16
17	judges just all be to ought	true	false	17
18	health necessary camp a is to clean	true	false	18
19	happiness source of always a crime is	true	false	19
20	bell most telephones have attached a	true	false	20
21	brings avarice man friends a	true	false	21
22	seen can the moon nights not be some	true	false	22
23	and emotions sorrow similar grief are	true	false	23
24	cardinal not cultivated virtues the be should	true	false	24

TEST 6

SAMPLES	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

2	3	4	5	6	7	.....	.....
10	9	8	7	6	5	.....	.....
5	10	15	20	25	30	.....	.....
8	8	6	6	4	4	.....	.....
6	9	12	15	18	21	.....	.....
9	1	7	1	5	1	.....	.....
3	7	11	15	19	23	.....	.....
4	5	8	9	12	13	.....	.....
25	25	21	21	17	17	.....	.....
1	2	4	8	16	32	.....	.....
21	18	16	13	11	8	.....	.....
12	14	13	15	14	16	.....	.....
3	4	6	9	13	18	.....	.....
16	12	15	11	14	10	.....	.....
25	24	22	21	19	18	.....	.....

½	36	10	18	44
1	25	12	13	22
2	16	15	17	20
4	9	16	14	10
8	4	18	16	8
16	1	21	15	4

TEST 7

SAMPLES
- sky—blue : : grass— **table** **green** **warm** **big**
- fish—swims : : man— **paper** **time** **walks** **girl**
- day—night : : white— **red** **black** **clear** **pure**

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	bird—sings : : dog— **fire** **barks** **snow** **flag**	1
2	eat—bread : : drink— **water** **iron** **lead** **stones**	2
3	father—son : : mother— **aunt** **nephew** **daughter** **sister**	3
4	heehaw—donkey : : bow-wow— **hen** **cat** **speech** **dog**	4
5	engineer—locomotive : : chauffeur— **drive** **auto** **horse** **wagon**	5
6	love—hatred : : friend— **lover** **mother** **need** **enemy**	6
7	wrist—bracelet : : neck— **collar** **leg** **foot** **giraffe**	7
8	sailor—navy : : soldier— **gun** **private** **army** **fight**	8
9	carpenter—house : : shoemaker— **hatmaker** **wax** **shoe** **leather**	9
10	shoestring—shoe : : button— **coat** **catch** **bell** **hook**	10
11	quinine—bitter : : sugar— **cane** **sweet** **salt** **beets**	11
12	tiger—wild : : cat— **dog** **mouse** **tame** **pig**	12
13	legs—man : : wheels— **spokes** **carriage** **go** **tire**	13
14	north—south : : east— **north** **west** **south** **east**	14
15	feather—float : : rock— **ages** **hill** **sink** **break**	15

16 grass—cattle : : bread— **man butter water bones**..... 16
17 fin—fish : : wing— **feather air bird sail**..... 17
18 paper—wall : : carpet— **tack grass sweep floor**..... 18
19 food—man : : fuel— **engine burn coal wood**..... 19
20 sled—runner : : buggy— **horse carriage harness wheel**..... 20

21 poison—death : : food— **eat bird life bad**..... 21
22 Japanese—Japan : : Chinese— **Russia China Japanese pigtail**..... 22
23 angels—heaven : : men— **earth women boys Paradise**..... 23
24 Washington—Adams : : first— **contrast best second last**..... 24
25 prince—princess : : king— **palace queen president kingdom**..... 25

26 able—unable : : strong— **weak able big ox**..... 26
27 add—subtract : : multiply— **add divide arithmetic increase**..... 27
28 past—present : : yesterday— **today tomorrow Christmas gone**..... 28
29 birth—death : : planting— **corn spring harvest wheat**..... 29
30 horse—mule : : obedient— **disgraceful donkey stubborn obey**..... 30

31 writer—books : : bee— **hive honey wasp sting**..... 31
32 light—dark : : noise— **report ring silence sound**..... 32
33 behind—late : : before— **after soon early dinner**..... 33
34 northpole—equator : : frigid— **cool Canada cold torrid**..... 34
35 success—failure : : joy— **pleasure sadness work fun**..... 35

36 prosperity—happiness : : adversity— **success sorrow fun rage**..... 36
37 character—important : : complexion— **trivial blonde brunette good**... 37
38 imitate—invent : : copy— **write pencil originate draw**..... 38
39 advice—command : : persuasion— **help aid urging compulsion**..... 39
40 Wednesday—week : : July— **August month hot year**..... 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes** **ears** **nose** **mouth**

The correct word is **ears**, because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
People **hear** with the **eyes** **ears** **nose** **mouth**
France is in **Europe** **Asia** **Africa** **Australia**

1	**Bull Durham** is the name of a **chewing gum** **aluminum ware** **tobacco** **clothing**	1
2	**Seven-up** is played with **rackets** **cards** **pins** **dice**	2
3	The **Merino** is a kind of **horse** **sheep** **goat** **cow**	3
4	The most prominent industry of **Minneapolis** is **flour packing** **automobiles** **brewing**	4
5	**Garnets** are usually **yellow** **blue** **green** **red**	5
6	The **Orpington** is a kind of **fowl** **horse** **granite** **cattle**	6
7	**George Ade** is famous as a **baseball player** **comic artist** **actor** **author**	7
8	**Soap** is made by **B. T. Babbitt** **Smith & Wesson** **W. L. Douglas** **Swift & Co.**	8
9	**Laura Jean Libby** is known as a **singer** **suffragist** **writer** **army nurse**	9
10	**"Eventually—why not now?"** is an "ad" for a **revolver cleanser** **flour** **automobile**	10
11	**Alfalfa** is a kind of **hay** **corn** **fruit** **rice**	11
12	The **rutabaga** is a **lizard** **vegetable** **fish** **snake**	12
13	**Harvard University** is in **Annapolis** **Cambridge** **Ithaca** **New Haven**	13
14	**Calcutta** is a city in **Egypt** **China** **India** **Japan**	14
15	**Pearls** are obtained from **mines** **elephants** **reefs** **oysters**	15

16 MacDowell is famous as a composer sculptor poet painter..... 16
17 The penguin is a bird fish reptile insect..... 17
18 The larynx is in the head neck abdomen shoulder..... 18
19 Peruna is a disinfectant food product patent medicine tooth paste..... 19
20 The U. S. S. Nebraska is a destroyer monitor submarine battleship..... 20

21 The howitzer is a kind of musket sword cannon pistol..... 21
22 The Burroughs is a kind of multigraph adding machine phonograph typewriter... 22
23 Cerise is a color drink fabric food..... 23
24 The cymbal is used in music stenography book-binding lithography..... 24
25 Pongee is a food dance fabric drink..... 25

26 The author of "Barrack Room Ballads" is Poe Stevenson Hawthorne Kipling.. 26
27 Joseph Choate was a merchant engineer lawyer scientist..... 27
28 An air-cooled engine is used in the Buick Packard Franklin Ford..... 28
29 Henry VIII's wives numbered 4 5 6 7 8 9..... 29
30 Newton was most famous in science politics literature war..... 30

31 Portia is in Vanity Fair Romola The Christmas Carol The Merchant of Venice... 31
32 The number of a Hottentot's legs is two four six eight..... 32
33 Homicide is a term used in medicine law theology pedagogy..... 33
34 A dibble is used in fishing hunting athletics farming..... 34
35 Lob is a term used in football hockey golf tennis..... 35

36 The Spanish-American War started in 1890 1898 1904 1914..... 36
37 The ohm is used in measuring rainfall wind power electricity water power..... 37
38 The Rolls-Royce car is made in England France Canada United States..... 38
39 Bile is made in the spleen kidneys stomach liver..... 39
40 A five-sided figure is called a scholium pentagon parallelogram trapezium..... 40

Form 8. Group Examination Alpha

(Test 1 is the same as for Form 5, following p. 204)

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

SAMPLES
1 How many are 5 men and 10 men? ..... Answer (15)
2 If you walk 4 miles an hour for 3 hours, how far do you walk? Answer (12)

1 How many are 60 guns and 5 guns? ..... Answer ( )
2 If you save $9 a month for 3 months, how much will you save? ..... Answer ( )
3 If 48 men are divided into squads of 8, how many squads will there be? ... Answer ( )
4 Mike had 11 cigars. He bought 2 more and then smoked 7. How many cigars did he have left? ..... Answer ( )
5 A company advanced 8 miles and retreated 2 miles. How far was it then from its first position? ..... Answer ( )
6 How many hours will it take a truck to go 42 miles at the rate of 3 miles an hour? ..... Answer ( )
7 How many pencils can you buy for 60 cents at the rate of 2 for 5 cents? .... Answer ( )
8 A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth 6 miles. How many miles did they march the last day? ..... Answer ( )
9 If you buy 2 packages of tobacco at 8 cents each and a pipe for 65 cents, how much change should you get from a two-dollar bill? ..... Answer ( )
10 If it takes 4 men 3 days to dig a 120-foot drain, how many men are needed to dig it in half a day? ..... Answer ( )

11 A dealer bought some mules for $2,000. He sold them for $2,400, making $50 on each mule. How many mules were there?.....Answer ( )

12 A rectangular bin holds 200 cubic feet of lime. If the bin is 10 feet long and 5 feet wide, how deep is it?.....Answer ( )

13 A recruit spent one-eighth of his spare change for post cards and twice as much for a box of letter paper, and then had $1.00 left. How much money did he have at first?.....Answer ( )

14 If 3½ tons of clover cost $14, what will 6½ tons cost?.....Answer ( )

15 A ship has provisions to last her crew of 700 men 2 months. How long would it last 400 men?.....Answer ( )

16 If an aëroplane goes 250 yards in 10 seconds, how many **feet** does it go in a fifth of a second?.....Answer ( )

17 A U-boat makes 8 miles an hour under water and 20 miles on the surface. How long will it take to cross a 100-mile channel, if it has to go two-fifths of the way under water?.....Answer ( )

18 If 134 squads of men are to dig 3,618 yards of trench, how many yards must be dug by each squad?.....Answer ( )

19 A certain division contains 5,000 artillery, 15,000 infantry, and 1,000 cavalry. If each branch is expanded proportionately until there are in all 23,100 men, how many will be added to the artillery?.....Answer ( )

20 A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 37 mess halls. Of this remainder each mess hall received 54 barrels. What was the total number of barrels supplied?.....Answer ( )

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE
Why do we use stoves? Because
☐ they look well
☒ they keep us warm
☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 It is wiser to put some money aside and not spend it all, so that you may
☐ prepare for old age or sickness
☐ collect all the different kinds of money
☐ gamble when you wish

2 Shoes are made of leather, because
☐ it is tanned
☐ it is tough, pliable and warm
☐ it can be blackened

3 Why do soldiers wear wrist watches rather than pocket watches? Because
☐ they keep better time
☐ they are harder to break
☐ they are handier

4 The main reason why stone is used for building purposes is because
☐ it makes a good appearance
☐ it is strong and lasting
☐ it is heavy

☞ *Go to No. 5 above*

5 Why is beef better food than cabbage? Because
☐ it tastes better
☐ it is more nourishing
☐ it is harder to obtain

6 If some one does you a favor, what should you do?
☐ try to forget it
☐ steal for him if he asks you to
☐ return the favor

7 If you do not get a letter from home which you know was written, it may be because
☐ it was lost in the mails
☐ you forgot to tell your people to write
☐ the postal service has been discontinued

8 The main thing the farmers do is to
☐ supply luxuries
☐ make work for the unemployed
☐ feed the nation

☞ Go to No. 9

9 If a man who can't swim should fall into a river, he should
- ☐ yell for help and try to scramble out
- ☐ dive to the bottom and crawl out
- ☐ lie on his back and float

10 Glass insulators are used to fasten telegraph wires because
- ☐ the glass keeps the pole from being burned
- ☐ the glass keeps the current from escaping
- ☐ the glass is cheap and attractive

11 If your load of coal gets stuck in the mud, what should you do?
- ☐ leave it there
- ☐ get more horses or men to pull it out
- ☐ throw off the load

12 Why are criminals locked up?
- ☐ to protect society
- ☐ to get even with them
- ☐ to make them work

13 Why should a married man have his life insured? Because
- ☐ death may come at any time
- ☐ insurance companies are usually honest
- ☐ his family will not then suffer if he dies

14 In Leap Year February has 29 days because
- ☐ February is a short month
- ☐ some people are born on February 29th
- ☐ otherwise the calendar would not come out right

15 If you are held up and robbed in a strange city, you should
- ☐ apply to the police for help
- ☐ ask the first man you meet for money to get home
- ☐ borrow some money at a bank

16 Why should we have Congressmen? Because
- ☐ the people must be ruled
- ☐ it insures truly representative government
- ☐ the people are too many to meet and make their laws

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES	good—bad	same—opposite	
	little—small	same—opposite	
1	no—yes	same—opposite	1
2	day—night	same—opposite	2
3	go—leave	same—opposite	3
4	begin—commence	same—opposite	4
5	bitter—sweet	same—opposite	5
6	assume—suppose	same—opposite	6
7	command—obey	same—opposite	7
8	tease—plague	same—opposite	8
9	diligent—industrious	same—opposite	9
10	corrupt—honest	same—opposite	10
11	toward—from	same—opposite	11
12	masculine—feminine	same—opposite	12
13	complex—simple	same—opposite	13
14	sacred—hallowed	same—opposite	14
15	often—seldom	same—opposite	15

16	ancient—modern	same—opposite	16
17	enormous—gigantic	same—opposite	17
18	confer—grant	same—opposite	18
19	acquire—lose	same—opposite	19
20	compute—calculate	same—opposite	20
21	defile—purify	same—opposite	21
22	apprehensive—fearful	same—opposite	22
23	sterile—fertile	same—opposite	23
24	chasm—abyss	same—opposite	24
25	somber—gloomy	same—opposite	25
26	vestige—trace	same—opposite	26
27	vilify—praise	same—opposite	27
28	finite—limited	same—opposite	28
29	contradict—corroborate	same—opposite	29
30	immune—susceptible	same—opposite	30
31	credit—debit	same—opposite	31
32	assiduous—diligent	same—opposite	32
33	transient—permanent	same—opposite	33
34	palliate—mitigate	same—opposite	34
35	execrate—revile	same—opposite	35
36	extinct—extant	same—opposite	36
37	pertinent—relevant	same—opposite	37
38	synchronous—simultaneous	same—opposite	38
39	supercilious—disdainful	same—opposite	39
40	abstruse—recondite	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order: ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
1	oranges yellow are	true	false	1
2	hear are with to ears	true	false	2
3	noise cannon never make a	true	false	3
4	trees in nests build birds	true	false	4
5	oil water not and will mix	true	false	5
6	bad are shots soldiers all	true	false	6
7	fuel wood are coal and for used	true	false	7
8	moon earth the only from feet twenty the is	true	false	8
9	to life water is necessary	true	false	9
10	are clothes all made cotton of	true	false	10

11	horses automobile an are than slower	true	false	11
12	tropics is in the produced rubber	true	false	12
13	leaves the trees in lose their fall	true	false	13
14	place pole is north comfortable a the	true	false	14
15	sand of made bread powder and is	true	false	15
16	sails is steamboat usually by propelled a	true	false	16
17	is the salty in water all lakes	true	false	17
18	usually judge can we actions man his by a	true	false	18
19	men misfortune have good never	true	false	19
20	tools valuable is for sharp making steel	true	false	20
21	due sometimes calamities are accident to	true	false	21
22	forget trifling friends grievances never	true	false	22
23	feeling is of painful exaltation the	true	false	23
24	begin a and apple acorn ant words with the	true	false	24

TEST 6

SAMPLES	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

3	4	5	6	7	8	.....	.....
8	7	6	5	4	3	.....	.....
10	15	20	25	30	35	.....	.....
9	9	7	7	5	5	.....	.....
3	6	9	12	15	18	.....	.....
8	1	6	1	4	1	.....	.....
5	9	13	17	21	25	.....	.....
8	9	12	13	16	17	.....	.....
27	27	23	23	19	19	.....	.....
1	2	4	8	16	32	.....	.....
19	16	14	11	9	6	.....	.....
11	13	12	14	13	15	.....	.....
2	3	5	8	12	17	.....	.....
18	14	17	13	16	12	.....	.....
29	28	26	22	19	14	.....	..

81	27	9	3	1	1/3	......	......
1	4	9	16	25	36	......	......
16	17	15	18	14	19	......	......
3	6	8	16	18	36	......	......

TEST 7

SAMPLES
sky—blue : : grass— **table** **green** **warm** **big**
fish—swims : : man— **paper** **time** **walks** **girl**
day—night : : white— **red** **black** **clear** **pure**

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	shoe—foot : : hat— **kitten** **head** **knife** **penny**	1
2	pup—dog : : lamb— **red** **door** **sheep** **book**	2
3	spring—summer : : autumn— **winter** **warm** **harvest** **rise**	3
4	devil—angel : : bad— **mean** **disobedient** **defamed** **good**	4
5	finger—hand : : toe— **body** **foot** **skin** **nail**	5
6	legs—frog : : wings— **eat** **swim** **bird** **nest**	6
7	chew—teeth : : smell— **sweet** **stink** **odor** **nose**	7
8	lion—roar : : dog— **drive** **pony** **bark** **harness**	8
9	cat—tiger : : dog— **wolf** **bark** **bite** **snap**	9
10	good—bad : : long— **tall** **big** **snake** **short**	10
11	giant—large : : dwarf— **jungle** **small** **beard** **ugly**	11
12	winter—season : : January— **February** **day** **month** **Christmas**	12
13	skating—winter : : swimming— **diving** **floating** **hole** **summer**	13
14	blonde—light : : brunette— **dark** **hair** **brilliant** **blonde**	14
15	love—friend : : hate— **malice** **saint** **enemy** **dislike**	15

16

16 egg—bird : : seed— **grow plant crack germinate** 16
17 dig—trench : : build— **run house spade bullet** 17
18 agree—quarrel : : friend— **comrade need mother enemy** 18
19 palace—king : : hut— **peasant cottage farm city** 19
20 cloud-burst—shower : : cyclone— **bath breeze destroy West** 20

21 Washington—Adams : : first— **president second last Bryan** 21
22 parents—command : : children— **men shall women obey** 22
23 diamond—rare : : iron— **common silver ore steel** 23
24 yes—affirmative : : no— **think knowledge yes negative** 24
25 hour—day : : day— **night week hour noon** 25

26 eye—head : : window— **key floor room door** 26
27 clothes—man : : hair— **horse comb beard hat** 27
28 draw—picture : : make— **destroy table break hard** 28
29 automobile—wagon : : motorcycle— **ride speed bicycle car** 29
30 granary—wheat : : library— **read books paper chairs** 30

31 Caucasian—English : : Mongolian— **Chinese Indian negro yellow** ... 31
32 Indiana—United States : : part— **hair China Ohio whole** 32
33 esteem—despise : : friends— **Quakers enemies lovers men** 33
34 abide—stay : : depart— **come hence leave late** 34
35 abundant—scarce : : cheap— **buy costly bargain nasty** 35

36 whale—large : : thunder— **loud rain lightning kill** 36
37 reward—hero : : punish— **God everlasting pain traitor** 37
38 music—soothing : : noise— **hear distracting sound report** 38
39 book—writer : : statue— **sculptor liberty picture state** 39
40 wound—pain : : health— **sickness disease exhilaration doctor** 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes** **ears** **nose** **mouth**

The correct word is **ears,** because it makes the truest sentence.

In each of the sentences below you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
People **hear** with the **eyes** **ears** **nose** **mouth**
France is in **Europe** **Asia** **Africa** **Australia**

1 The **apple** grows on a **shrub** **vine** **bush** **tree** 1
2 **Five hundred** is played with **rackets** **pins** **cards** **dice** 2
3 The **Percheron** is a kind of **goat** **horse** **cow** **sheep** 3
4 The most prominent industry of **Gloucester** is **fishing** **packing** **brewing** **automobiles** 4
5 **Sapphires** are usually **blue** **red** **green** **yellow** 5

6 The **Rhode Island Red** is a kind of **horse** **granite** **cattle** **fowl** 6
7 **Christie Mathewson** is famous as a **writer** **artist** **baseball player** **comedian** 7
8 **Revolvers** are made by **Swift & Co.** **Smith & Wesson** **W. L. Douglas** **B. T. Babbitt** 8
9 **Carrie Nation** is known as a **singer** **temperance agitator** **suffragist** **nurse** 9
10 **"There's a reason"** is an "ad" for a **drink** **revolver** **flour** **cleanser** 10

11 **Artichoke** is a kind of **hay** **corn** **vegetable** **fodder** 11
12 **Chard** is a **fish** **lizard** **vegetable** **snake** 12
13 **Cornell University** is at **Ithaca** **Cambridge** **Annapolis** **New Haven** 13
14 **Buenos Ayres** is a city of **Spain** **Brazil** **Portugal** **Argentina** 14
15 **Ivory** is obtained from **elephants** **mines** **oysters** **reefs** 15

16 **Alfred Noyes** is famous as a **painter poet musician sculptor**..... 16
17 The **armadillo** is a kind of **ornamental shrub animal musical instrument dagger**. 17
18 The **tendon of Achilles** is in the **heel head shoulder abdomen**..... 18
19 **Crisco** is a **patent medicine disinfectant tooth-paste food product**..... 19
20 An **aspen** is a **machine fabric tree drink**..... 20

21 The **sabre** is a kind of **musket sword cannon pistol**..... 21
22 The **mimeograph** is a kind of **typewriter copying machine phonograph pencil**..... 22
23 **Maroon** is a **food fabric drink color**..... 23
24 The **clarionet** is used in **music stenography book-binding lithography**..... 24
25 **Denim** is a **dance food fabric drink**..... 25

26 The author of "**Huckleberry Finn**" is **Poe Mark Twain Stevenson Hawthorne**.. 26
27 **Faraday** was most famous in **literature war religion science**..... 27
28 **Air and gasolene** are mixed in the **accelerator carburetor gear case differential**.. 28
29 The **Brooklyn Nationals** are called the **Giants Orioles Superbas Indians**..... 29
30 **Pasteur** is most famous in **politics literature war science**..... 30

31 **Becky Sharp** appears in **Vanity Fair Romola The Christmas Carol Henry IV**.... 31
32 The number of a **Kaffir's** legs is **two four six eight**..... 32
33 **Habeas corpus** is a term used in **medicine law theology pedagogy**..... 33
34 **Ensilage** is a term used in **fishing athletics farming hunting**..... 34
35 The **forward pass** is used in **tennis hockey football golf**..... 35

36 **General Lee** surrendered at Appomattox in **1812 1865 1886 1832**..... 36
37 The **watt** is used in measuring **wind power rainfall water power electricity**..... 37
38 The **Pierce Arrow car** is made in **Buffalo Detroit Toledo Flint**..... 38
39 **Napoleon** defeated the **Austrians** at **Friedland Wagram Waterloo Leipzig**..... 39
40 An **irregular four-sided figure** is called a **scholium triangle trapezium pentagon**.. 40

Form 9. Group Examination Alpha

(Test 1 is the same as for Form 5, following page 204)

TEST 2

Get the answers to these examples as quickly as you can.
Use the side of this page to figure on if you need to.

SAMPLES
1 How many are 5 men and 10 men?.....Answer (15)
2 If you walk 4 miles an hour for 3 hours, how far do you walk? Answer (12)

1 How many are 20 boats and 9 boats?.....Answer ( )
2 If you save $4 a month for 9 months, how much will you save?.....Answer ( )
3 If 64 men are divided into squads of 8, how many squads will there be?...Answer ( )
4 Mike had 11 cigars. He bought 3 more and then smoked 8. How many cigars did he have left?.....Answer ( )
5 A company advanced 6 miles and retreated 2 miles. How far was it then from its first position?.....Answer ( )
6 How many hours will it take a truck to go 48 miles at the rate of 3 miles an hour?.....Answer ( )
7 How many cigars can you buy for $1.00 at the rate of 2 for 5 cents?.....Answer ( )
8 A regiment marched 40 miles in five days. The first day they marched 9 miles, the second day 6 miles, the third 10 miles, the fourth, 7 miles. How many miles did they march the last day?.....Answer ( )
9 If you buy 2 packages of tobacco at 7 cents each and a pipe for 75 cents, how much change should you get from a two-dollar bill?.....Answer ( )
10 If it takes 5 men 4 days to dig a 200-foot drain, how many men are needed to dig it in half a day?.....Answer ( )

11 A dealer bought some mules for $1,200. He sold them for $1,000, making $50 on each mule. How many mules were there? ..... Answer ( )

12 A rectangular bin holds 500 cubic feet of lime. If the bin is 10 feet long and 5 feet deep, how wide is it? ..... Answer ( )

13 A recruit spent one-eighth of his spare change for post cards and twice as much for a box of letter paper, and then had $2.00 left. How much money did he have at first? ..... Answer ( )

14 If 5½ tons of bark cost $33, what will 3½ tons cost? ..... Answer ( )

15 A ship has provisions to last her crew of 400 men 6 months. How long would it last 1,600 men? ..... Answer ( )

16 If an aëroplane goes 300 yards in 10 seconds, how many **feet** does it go in a fifth of a second? ..... Answer ( )

17 A U-boat goes 6 miles an hour under water and 20 miles an hour on the surface. How long will it take to cross a 100-mile channel, if it has to go three-fifths of the way under water? ..... Answer ( )

18 If 214 squads of men are to dig 5,992 yards of trench, how many yards must be dug by each squad? ..... Answer ( )

19 A certain division contains 6,000 artillery, 15,000 infantry, and 1,000 cavalry. If each branch is expanded proportionately until there are in all 24,200 men, how many will be added to the artillery? ..... Answer ( )

20 A commission house which had already supplied 1,897 barrels of apples to a cantonment delivered the remainder of its stock to 38 mess halls. Of this remainder each mess hall received 45 barrels. What was the total number of barrels supplied? ..... Answer ( )

TEST 3

This is a test of common sense. Below are sixteen questions. Three answers are given to each question. You are to look at the answers carefully; then make a cross in the square before the best answer to each question, as in the sample:

SAMPLE
Why do we use stoves? Because
- ☐ they look well
- ☒ they keep us warm
- ☐ they are black

Here the second answer is the best one and is marked with a cross. Begin with No. 1 and keep on until time is called.

1 Cotton fibre is much used for making cloth because
- ☐ it grows all over the South
- ☒ it can be spun and woven
- ☐ it is a vegetable product

2 Thermometers are useful, because
- ☐ they regulate the temperature
- ☒ they tell us how warm it is
- ☐ they contain mercury

3 Why are doctors useful? Because they
- ☐ understand human nature
- ☐ always have pleasant dispositions
- ☒ know more about diseases than others

4 Why ought a grocer to own an automobile? Because
- ☒ it is useful in his business
- ☐ it uses rubber tires
- ☐ it saves railroad fare

☞ Go to No. 5 above

5 A machine gun is more deadly than a rifle, because it
- ☐ was invented more recently
- ☒ fires more rapidly
- ☐ can be used with less training

6 Why is the telephone more useful than the telegraph? Because
- ☒ it gets a quicker answer
- ☐ it uses more miles of wire
- ☐ it is a more recent invention

7 Why is wool better than cotton for making sweaters? Because
- ☐ wool is cheaper
- ☒ it is warmer
- ☐ it wears longer

8 Why is New York larger than Boston? Because
- ☐ it has more railroads
- ☐ it has more millionaires
- ☒ it is better located

☞ Go to No. 9

9 Every soldier should be inoculated against typhoid fever, because
- ☐ many men have typhoid
- ☐ the doctors insist on it
- ☒ it prevents epidemics

10 Theatres are useful institutions because
- ☐ They employ actors
- ☒ they afford a method of relaxation
- ☐ they give the rich a chance to spend their money

11 A train is harder to stop than an automobile because
- ☐ it is longer
- ☒ it is heavier
- ☐ the brakes are not so good

12 Why is winter colder than summer? Because
- ☒ the sun shines obliquely upon us in winter
- ☐ January is a cold month
- ☐ there is much snow in winter

☞ Go to No. 13 above

13 Many schools are closed in summer, so that
- ☐ the teachers may have a vacation
- ☒ the children shall not be indoors in hot weather
- ☐ the schoolhouses may be repaired

14 If a drunken man is quarrelsome and insists on fighting you, it is usually better to
- ☐ knock him down
- ☐ call the police
- ☒ leave him alone

15 Why are electrical engineers highly paid? Because
- ☒ their ability is much in demand
- ☐ they have a college education
- ☐ they work long hours

16 Aëroplanes failed for many years because
- ☐ they were too heavy
- ☐ the materials cost too much
- ☒ the motor was not perfected

TEST 4

If the two words of a pair mean the same or nearly the same, draw a line under *same*. If they mean the opposite or nearly the opposite, draw a line under *opposite*. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES	good—bad	same—<u>opposite</u>	
	little—small	<u>same</u>—opposite	
1	high—low	same—opposite	1
2	slow—fast	same—opposite	2
3	large—great	same—opposite	3
4	danger—safety	same—opposite	4
5	genuine—real	same—opposite	5
6	choose—select	same—opposite	6
7	fault—virtue	same—opposite	7
8	similar—different	same—opposite	8
9	jealousy—envy	same—opposite	9
10	sacred—profane	same—opposite	10
11	conquer—subdue	same—opposite	11
12	vanity—conceit	same—opposite	12
13	allure—attract	same—opposite	13
14	waste—conserve	same—opposite	14
15	deride—ridicule	same—opposite	15

16	censure—praise	same—opposite	16
17	illustrious—exalted	same—opposite	17
18	agitate—excite	same—opposite	18
19	haggard—gaunt	same—opposite	19
20	con—pro	same—opposite	20
21	eminent—distinguished	same—opposite	21
22	conspicuous—prominent	same—opposite	22
23	depressed—elated	same—opposite	23
24	orifice—aperture	same—opposite	24
25	erudite—scholarly	same—opposite	25
26	recline—stand	same—opposite	26
27	degenerate—deteriorate	same—opposite	27
28	martial—civil	same—opposite	28
29	nonchalance—anxiety	same—opposite	29
30	torpor—stupor	same—opposite	30
31	comprehensive—restricted	same—opposite	31
32	latent—hidden	same—opposite	32
33	node—knot	same—opposite	33
34	celestial—terrestrial	same—opposite	34
35	carnivorous—herbivorous	same—opposite	35
36	urbanity—civility	same—opposite	36
37	proclivity—inclination	same—opposite	37
38	putrid—fetid	same—opposite	38
39	impecunious—opulent	same—opposite	39
40	choleric—phlegmatic	same—opposite	40

TEST 5

The words A EATS COW GRASS in that order are mixed up and don't make a sentence; but they would make a sentence if put in the right order: A COW EATS GRASS, and this statement is true.

Again, the words HORSES FEATHERS HAVE ALL would make a sentence if put in the order: ALL HORSES HAVE FEATHERS, but this statement is false.

Below are twenty-four mixed-up sentences. Some of them are true and some are false. When I say "go," take these sentences one at a time. Think what each **would** say if the words were straightened out, but don't write them yourself. Then, if what it **would** say is true, draw a line under the word "true"; if what it **would** say is false, draw a line under the word "false." If you can not be sure, guess. The two samples are already marked as they should be. Begin with No. 1 and work right down the page until time is called.

SAMPLES	a eats cow grass	true	false	
	horses feathers have all	true	false	
1	iron heavy is	true	false	1
2	chairs sit are to on	true	false	2
3	Alaska in cotton grows	true	false	3
4	happy is man sick always a	true	false	4
5	wood eat and good to are coal	true	false	5
6	Germany of Wilson king is England and	true	false	6
7	day it snow does every not	true	false	7
8	war in are useful aëroplanes	true	false	8
9	sounds people some loud annoy	true	false	9
10	thunders rains when it always it	true	false	10

11	food is tobacco as valuable a not	true	false	11
12	trees roses sea and in grow the	true	false	12
13	pole north equator mile one from is the the	true	false	13
14	a battle in racket very tennis useful is	true	false	14
15	made cloth wool cotton and is from	true	false	15
16	seldom forever good lasts luck	true	false	16
17	a ocean cross minutes few can boat the in a	true	false	17
18	seldom birds' diamonds nests are in found	true	false	18
19	love we wrong those us always who	true	false	19
20	to aid deep great snow a military manœuvres is	true	false	20
21	never man the show the deeds	true	false	21
22	always is not a a stenographer bookkeeper	true	false	22
23	never who heedless those stumble are	true	false	23
24	people enemies arrogant many make	true	false	24

TEST 6

SAMPLES	2	4	6	8	10	12	*14*	*16*
	9	8	7	6	5	4	*3*	*2*
	2	2	3	3	4	4	*5*	*5*
	1	7	2	7	3	7	*4*	*7*

Look at each row of numbers below, and on the two dotted lines write the two numbers that should come next.

2	3	4	5	6	7	.....	.....
10	15	20	25	30	35	.....	.....
8	7	6	5	4	3	.....	.....
6	9	12	15	18	21	.....	.....
5	9	13	17	21	25	.....	.....
8	1	6	1	4	1	.....	.....
25	25	21	21	17	17	.....	.....
1	2	4	8	16	32	.....	.....
4	5	8	9	12	13	.....	.....
8	8	6	6	4	4	.....	.....
19	16	14	11	9	6	.....	....
3	4	6	9	13	18	.....	.....
12	14	13	15	14	16	.....	.....
29	28	26	23	19	14	.....	.....
18	14	17	13	16	12	.....	.....
16	8	4	2	1	½	.....	.....

18	36	10	36
13	25	12	18
17	16	15	16
14	9	16	8
16	4	18	6
15	1	21	3

TEST 7

SAMPLES
- sky—blue : : grass— **table** **green** **warm** **big**
- fish—swims : : man— **paper** **time** **walks** **girl**
- day—night : : white— **red** **black** **clear** **pure**

In each of the lines below, the first two words are related to each other in some way. What you are to do in each line is to see what the relation is between the first two words, and underline the word in heavy type that is related in the same way to the third word. Begin with No. 1 and mark as many sets as you can before time is called.

1	finger—hand : : toe— **box foot doll coat**	1
2	sit—chair : : sleep— **book tree bed see**	2
3	skirts—girl : : trousers— **boy hat vest coat**	3
4	December—Christmas : : November— **month Thanksgiving December early**	4
5	above—top : : below— **above bottom sea hang**	5
6	spoon—soup : : fork— **knife plate cup meat**	6
7	bird—song : : man— **speech woman boy work**	7
8	corn—horse : : bread— **daily flour man butter**	8
9	sweet—sugar : : sour— **sweet bread man vinegar**	9
10	devil—bad : : angel— **Gabriel good face heaven**	10
11	Edison—phonograph : : Columbus— **America Washington Spain Ohio**	11
12	cannon—rifle : : big— **bullet gun army little**	12
13	engineer—engine : : driver— **harness horse passenger man**	13
14	wolf—sheep : : cat— **fur kitten dog mouse**	14
15	officer—private : : command— **army general obey regiment**	15

16 hunter—gun : : fisherman— **fish net bold wet** 16
17 cold—heat : : ice— **steam cream frost refrigerator** 17
18 uncle—nephew : : aunt— **brother sister niece cousin** 18
19 framework—house : : skeleton— **bones skull grace body** 19
20 breeze—cyclone : : shower— **bath cloudburst winter spring** 20

21 pitcher—milk : : vase— **flowers pitcher table pottery** 21
22 blonde—brunette : : light— **heavy electricity dark girl** 22
23 abundant—cheap : : scarce— **costly plentiful common gold** 23
24 polite—impolite : : pleasant— **agreeable disagreeable man face** 24
25 mayor—city : : general— **private navy army soldier** 25

26 succeed—fail : : praise— **lose friend God blame** 26
27 people—house : : bees— **thrive sting hive thick** 27
28 peace—happiness : : war— **grief fight battle Europe** 28
29 a—b : : c— **e b d letter** 29
30 darkness—stillness : : light— **moonlight sound sun window** 30

31 complex—simple : : hard— **brittle money easy work** 31
32 music—noise : : harmonious— **hear accord violin discordant** 32
33 truth—gentleman : : lie— **rascal live give falsehood** 33
34 blow—anger : : caress— **woman kiss child love** 34
35 square—cube : : circle— **line round square sphere** 35

36 mountain—valley : : genius— **idiot write think brain** 36
37 clock—time : : thermometer— **cold weather temperature mercury** 37
38 fear—anticipation : : regret— **vain memory express resist** 38
39 hope—cheer : : despair— **grave repair death depression** 39
40 dismal—dark : : cheerful— **laugh bright house gloomy** 40

TEST 8

Notice the sample sentence:

People **hear** with the **eyes** **ears** **nose** **mouth**

The correct word is **ears**, because it makes the truest sentence.

In each of the sentences below, you have four choices for the last word. Only one of them is correct. In each sentence draw a line under the one of these four words which makes the truest sentence. If you can not be sure, guess. The two samples are already marked as they should be.

SAMPLES
People **hear** with the **eyes** **ears** **nose** **mouth**
France is in **Europe** **Asia** **Africa** **Australia**

1 The **pitcher** has an important place in **tennis** **football** **baseball** **handball** 1
2 **Cribbage** is played with **rackets** **mallets** **dice** **cards** 2
3 The **Holstein** is a kind of **cow** **horse** **sheep** **goat** 3
4 The most prominent industry of **Chicago** is **packing** **brewing** **automobiles** **flour** ... 4
5 The **topaz** is usually **red** **yellow** **blue** **green** 5

6 The **Plymouth Rock** is a kind of **horse** **cattle** **granite** **fowl** 6
7 **Irving Cobb** is famous as a **baseball player** **actor** **writer** **artist** 7
8 **Clothing** is made by **Smith & Wesson** **Kuppenheimer** **B. T. Babbitt** **Swift & Co.** .. 8
9 **Carrie Chapman Catt** is known as a **singer** **writer** **nurse** **suffragist** 9
10 **"The flavor lasts"** is an "ad" for **chewing gum** **drink** **health food** **fruit** 10

11 **Timothy** is a kind of **corn** **rye** **wheat** **hay** 11
12 **Kale** is a **fish** **lizard** **vegetable** **snake** 12
13 The **U. S. Naval Academy** is at **West Point** **Annapolis** **New Haven** **Ithaca** 13
14 **Rio Janeiro** is a city of **Spain** **Argentina** **Portugal** **Brazil** 14
15 **Emeralds** are obtained from **elephants** **mines** **oysters** **reefs** 15

16 **John Sargent** is famous as a **sculptor author painter poet** 16
17 The **iguana** is a **reptile bird fish insect** 17
18 The **clavicle** is in the **shoulder head abdomen neck** 18
19 **Karo** is a **patent medicine disinfectant tooth paste food product** 19
20 **Eucalyptus** is a **machine tree drink fabric** 20

21 The **carbine** is a kind of **pistol cannon musket sword** 21
22 The **multigraph** is a kind of **typewriter pencil copying machine phonograph** 22
23 **Magenta** is a **fabric drink food color** 23
24 The **piccolo** is used in **music stenography book-binding lithography** 24
25 **Cambric** is a **dance fabric food color** 25

26 The author of "**Treasure Island**" is **Poe Stevenson Kipling Hawthorne** 26
27 **Blackstone** is most famous in **law literature science religion** 27
28 The **spark plug** belongs in the **crank case manifold carburetor cylinder** 28
29 The **Bartlett** is a kind of **fruit fish fowl cattle** 29
30 **Kelvin** was most famous in **politics war science literature** 30

31 **Little Nell** appears in **Vanity Fair Romola The Old Curiosity Shop Henry IV** 31
32 The number of a **Papuan's** legs is **two four six eight** 32
33 **Arson** is a term used in **medicine law theology pedagogy** 33
34 The **silo** is used in **fishing farming hunting athletics** 34
35 A **puck** is used in **tennis football hockey golf** 35

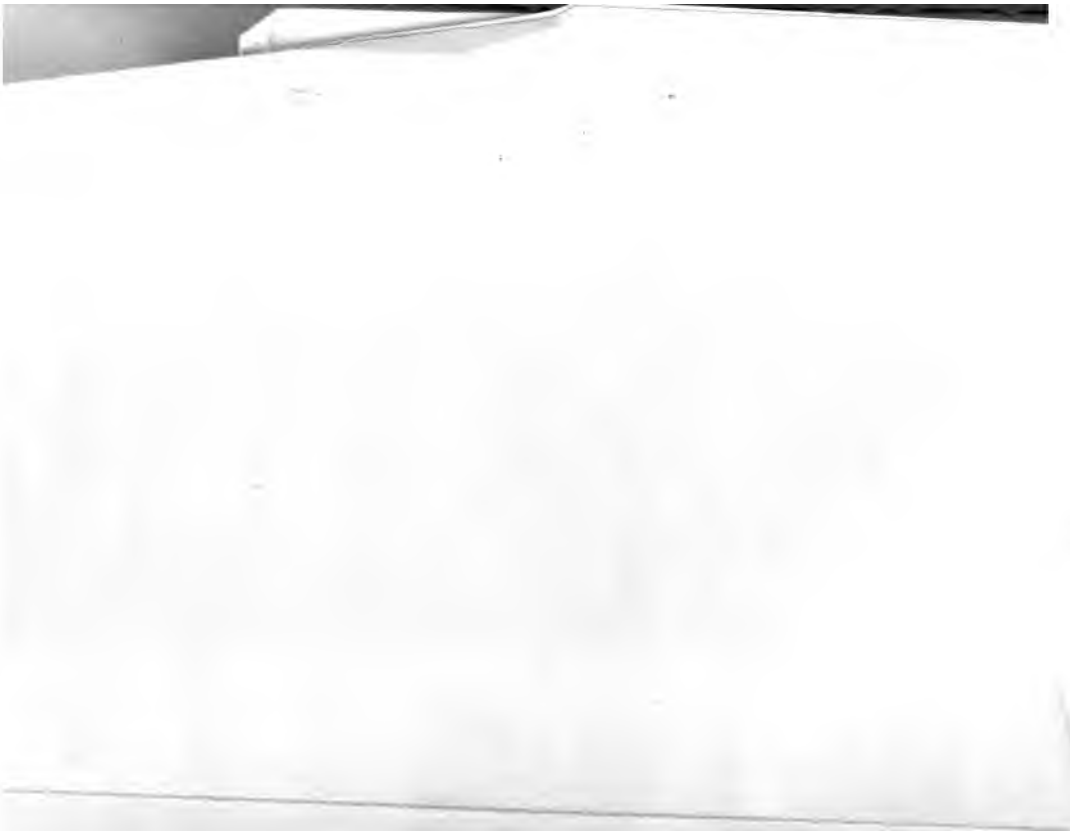
36 **Dewey** defeated the Spanish fleet in **Newport News Boston Harbor China Sea Manila Bay** 36
37 The **volt** is used in measuring **electricity wind power rainfall water power** 37
38 The **Packard car** is made in **Detroit Buffalo Toledo Flint** 38
39 The **Cooper Hewitt lamp** uses the vapor of **gasolene mercury tungsten alcohol** ... 39
40 **A regular five-sided figure** is **scalene rhomboid equilateral elliptical** 40

GROUP EXAMINATION BETA

On the record blank the tests of Group Examination Beta were printed in the order 1 to 8, but the blank form for name, rank, age, et cetera, was placed on the last page of the record blank above test 8,[1] instead of on the first page above test 1, as in the case of examination alpha. This was done in order to prevent the subject from examining the mazes of test 1 while awaiting directions for filling in the general information blanks.

The beta tests as reproduced in this book are marked correctly (keyed), with the exception of tests 4 and 6. For the latter the missing parts are as follows: picture 1, mouth; 2, eye; 3, nose; 4, spoon; 5, chimney; 6, ear; 7, filament; 8, stamp; 9, strings; 10, rivet; 11, trigger; 12, tail; 13, leg; 14, shadow; 15, ball; 16, net; 17, hand; 18, horn; 19, reflection of hand holding powder puff; 20, diamond in upper left corner.

[1] Test 8, although printed on the record blank, was not used.



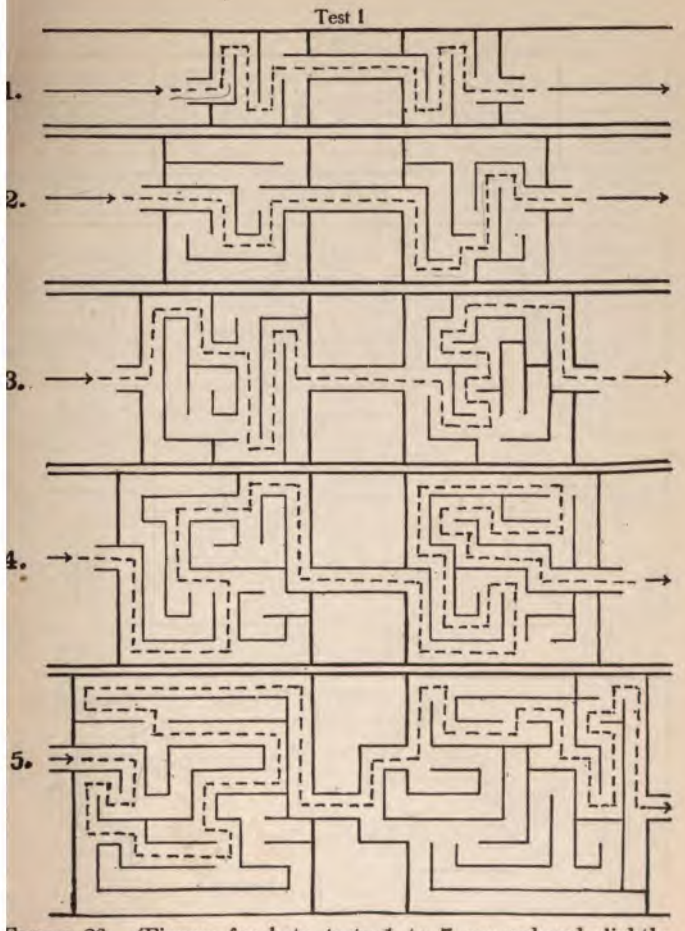


FIGURE 26.—(Figures for beta tests 1 to 7 are reduced slightly more than one half).

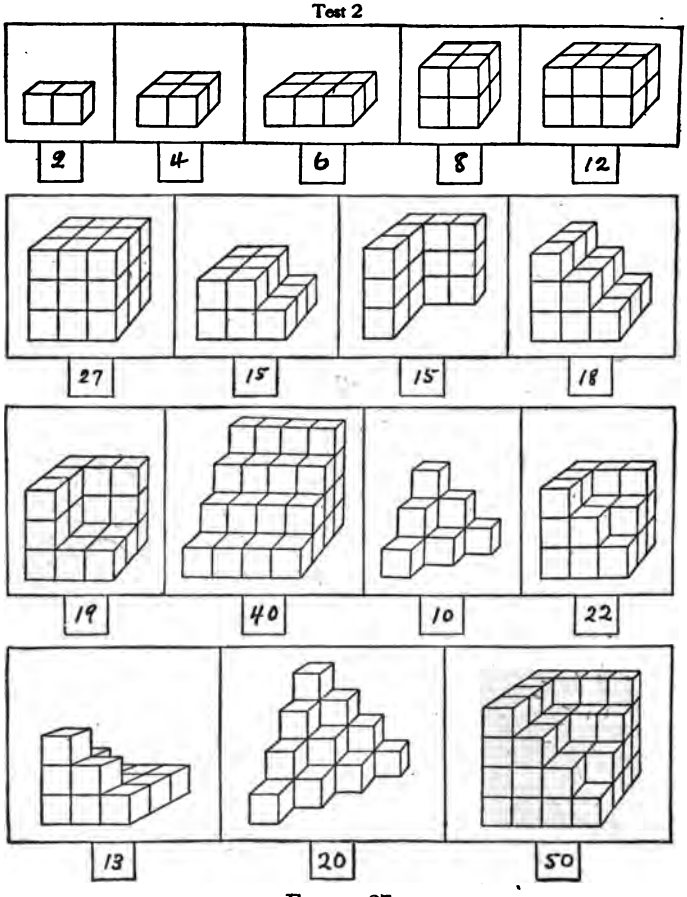


FIGURE 27.

Test 3

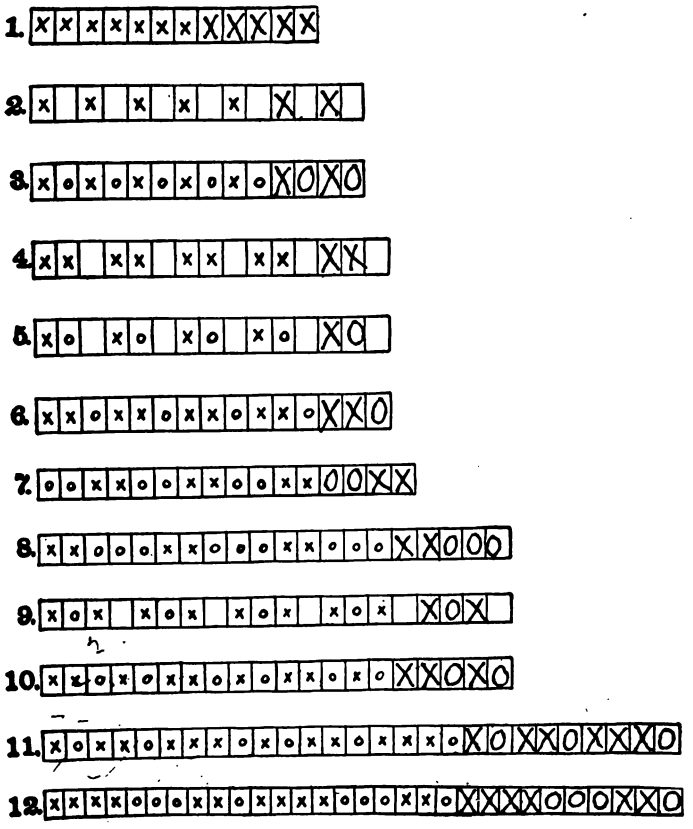


FIGURE 28.

Test 4

1	2	3	4	5	6	7	8	9
−	∩	⊐	L	∪	o	∧	X	=

1.	3	1	2	1	3	2	1	4	2	3	5	2	9	1	4
2.	6	3	1	5	4	2	7	6	3	8	7	2	9	5	4
3.	6	3	7	2	8	1	9	5	8	4	7	3	6	9	5
4.	1	9	2	8	3	7	4	6	5	9	4	8	5	7	6
5.	9	3	8	6	4	1	5	7	2	6	2	4	8	1	3
6	4	9	5	1	7	5	2	6	9	3	7	8	4	1	8

FIGURE 29.

Test 5

650	650 X	10248586	10248586 X
041	644	659013584	659021854
2579	2579 X	388172902	381872902
3281	3281 X	631027594	631027594 X
55190	55102	2499901854	2499901584
89190	89190 X	2261059810	2261659810
658049	650849	2911038227	2911038227 X
3295017	3290517	313377752	313377752 X
63015991	63019991	1012938567	1012938567 X
89007106	89007106 X	7166220988	7162220988
69931087	69931087 X	3177628449	3177682449
251004818	251004418	468672668	468672668 X
299056013	299056013 X	9104529003	9194529003
86015992	860155992	3484657120	3484657210
3910066482	391006482	8588172556	8581722556
8510273801	8510273801 X	3120166671	3120166671 X
263136996	263136996 X	7611348879	76111345879
451152903	451152903 X	26557239164	26557239164 X
3259016275	3295016725	8819002341	8819002341 X
582039144	582039144 X	6571018034	6571018034 X
61558529	61588529	38779762514	38779765214
211915883	219915883	39008126557	39008126657
670413822	670143822	75658100398	75658100398 X
17198591	17198591 X	41181900726	41181900726 X
36482991	36482991 X	6543920817	6548920871

FIGURE 30.

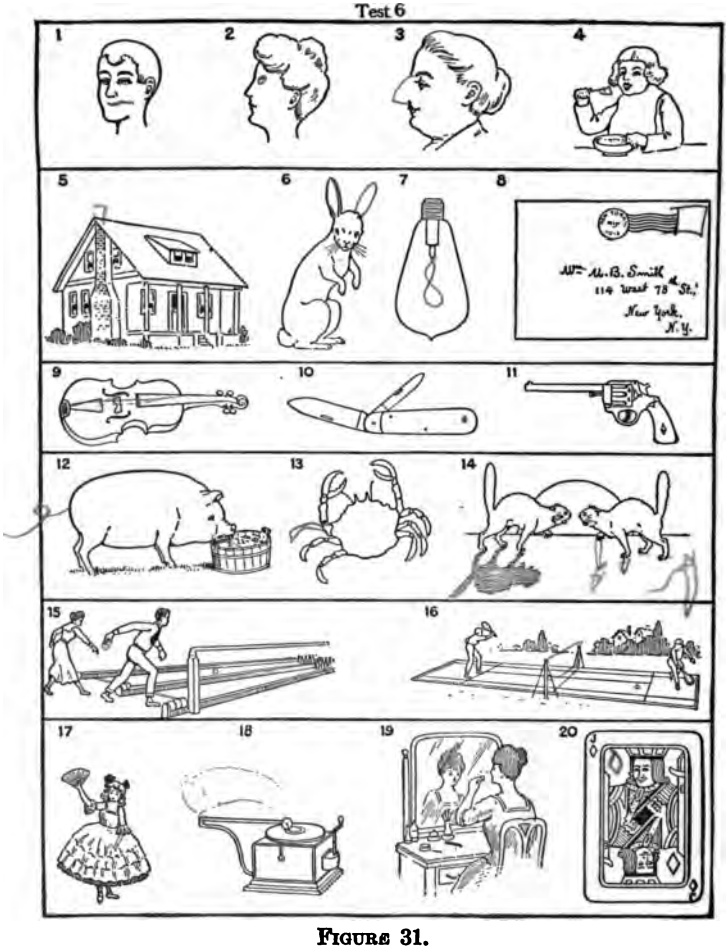

Test 6
1
2
3
4
5
6
7
8
Mr. M. B. Smith
114 West 78 St.
New York.
N. Y.
9
10
11
12
13
14
15
16
17
18
19
20

FIGURE 31.

Test 7

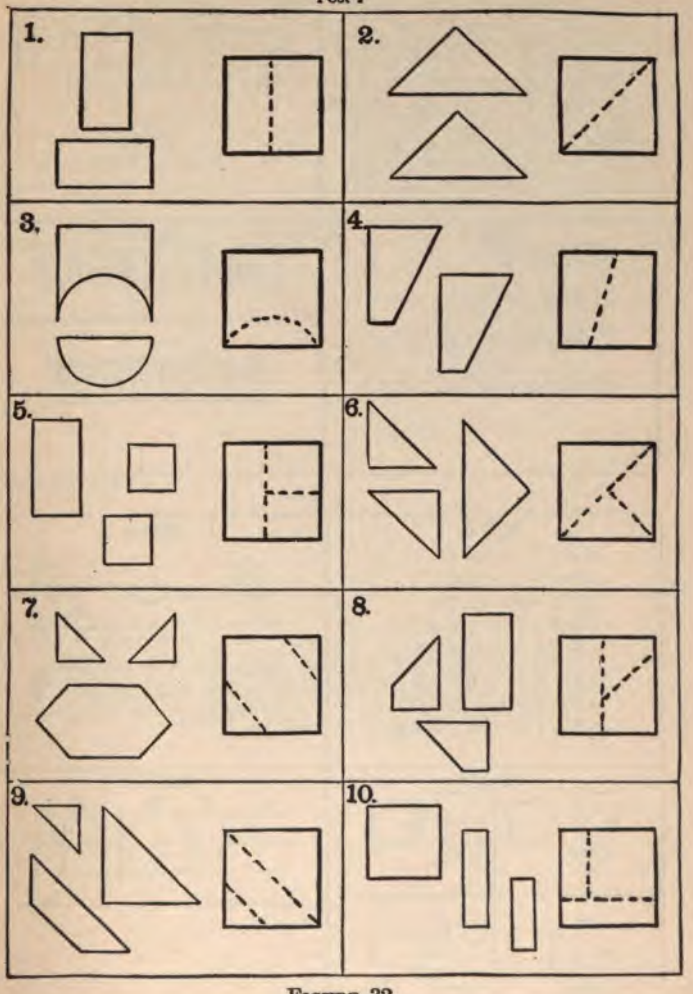


FIGURE 32.

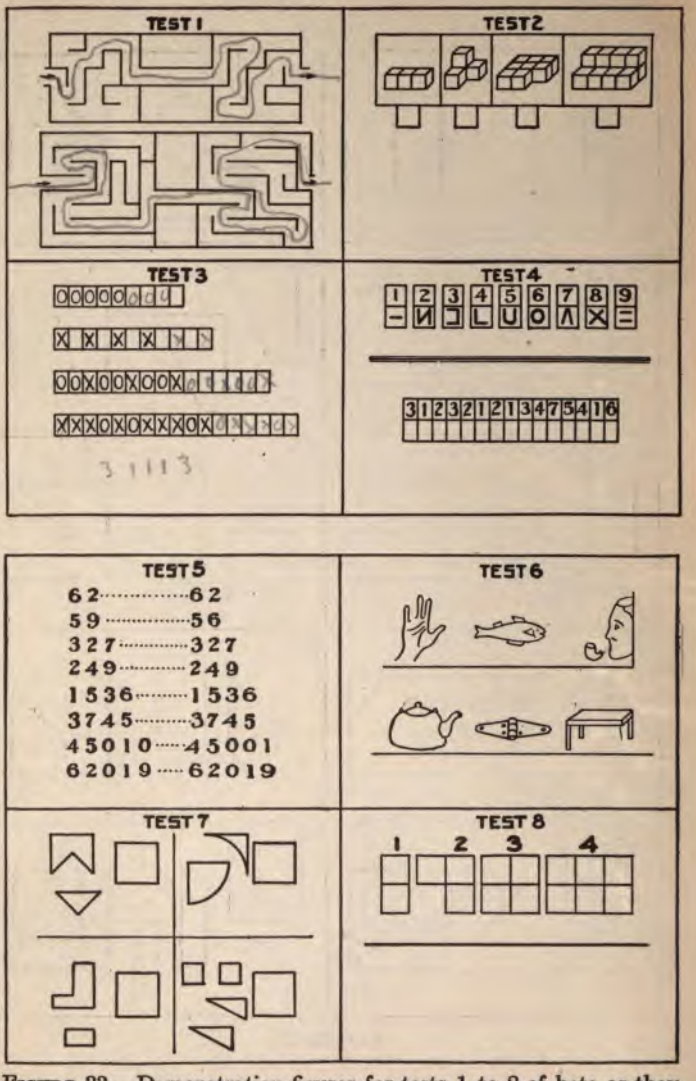


FIGURE 33.—Demonstration figures for tests 1 to 8 of beta as they appeared on beta blackboard.

POINT SCALE EXAMINATION

Name..... Age..... Race.....
Co..... Regiment..... Arm..... Division..... Station.....
Where born..... Yrs. in U. S.....
Previous occupation..... Weekly wages.....
Education: grade reached..... H. S..... College.....
Where educated..... Yrs. in school.....
Language ability.....
Disease history, personal and family.....
.....
.....

Remarks:

Total Score.....
Mental Age.....
Rating.....

Examiner's report:

Signature of Examiner..... Date.....

Division of Psychology, Medical Department, U. S. A.
Authorized by the Surgeon-General, Feb. 8, 1918
Edition, August 7, 1918, 100,000

TEST	CREDITS
1. Chooses, prettier, each pair correctly twice (1 each, total 3) 1..... 2..... 3.....	
2. Sees picture lacks: (*a*) arms; (*b*) nose; (*c*) mouth; (*d*) eyes. (1 each).....	
3. Compares, twice:	
(*a*) Lines, 5 and 6 cm. (1).....	
(*b*) Weights, 3 and 12 grams. (1)	
(*c*) Weights, 6 and 15 grams. (1)	
4. Memory span for digits.....	
(*a*) 374. 581. (1)	
(*b*) 2947. 6135. (1)	
(*c*) 35871. 92736. (1)	
(*d*) 491572. 516283. (1)	
(*e*) 2749385. 6195847. (1)	
5. Counts backward: 20—1 (4); 15—1 (3); 10—1 (2); 5—1 (1).....	
6. Repeats: (*a*) It rains. I am hungry. (1).....	
(*b*) His name is John. It is a very fine day. (1)	
(*c*) The sun is very large and red. Our train was more than two hours late. (2)	
(*d*) It is not necessary to hurt the poor little little birds. It is night and all the world rests in sleep. (2)	
7. Reaction to three Binet pictures: enumeration, (1 each); description, (2 each); interpretation, (3 each).....	
(*a*) Man and boy	
(*b*) Man and woman	
(*c*) Man	
8. Arranges weights: two trials. All correct but one (1); correct (2). Trial 1..... Trial 2.....	
9. Compares: (2 each).....	
(*a*) Apple and banana	
(*b*) Wood and glass	
(*c*) Paper and cloth	
10. Defines in terms of use, (1 each); superior to use, (2 each).....	
(*a*) Spoon	
(*b*) Chair	
(*c*) Horse	
(*d*) Baby	

TEST	CREDITS
11. Resists suggestions: (1 for each resistance) 1..... 2..... 3..... 4..... 5..... 6.....	
12. Copies (on back of this sheet) (*a*) square (1 or 2); (*b*) diamond (1 or 2).....	
13. Gives words for three minutes: 30—44 (1); 45—59 (2); 60—74 (3); 75—and over (4).....	
1st half minute 2d 3rd 4th 5th 6th	
14. Writes (on back of this sheet) sentence containing Boston, money, river. Three words in two (2); three words in one (4).....	
15. Comprehends questions: (2 each).....	
(*a*) Missed train	
(*b*) Someone unkind	
(*c*) Action versus words	
(*d*) Forgive easier	
16. Draws (on back of this sheet) designs from memory, after 15 sec. exposure. (1 or 2 each).....	
17. Sees absurdity: (1 each).....	
(*a*) Swinging cane	
(*b*) Unfortunate cyclist	
(*c*) Three brothers	
(*d*) Guide-post directions	
(*e*) Last car	
18. Puts dissected sentences together. (2 each).....	
(*a*) My teacher	
(*b*) A good dog	
(*c*) We started	
19. Defines (*a*) Charity (2).....	
(*b*) Obedience (2)	
(*c*) Justice (2)	
20. Analogies: (1 each).....	
(*a*) Oyster is to shell as banana is to	
(*b*) Arm is to elbow as leg is to	
(*c*) Head is to hat as hand is to	
(*d*) Truth is to falsehood as straight line is to	
(*e*) Known is to unknown as present is to	
(*f*) Storm is to calm as war is to	

The record blank used in the Army for the Stanford-Binet examination is not reproduced here because of copyright restrictions.

PERFORMANCE SCALE EXAMINATION

Name ..... Age ..... Race .....
Company ..... Regiment ..... Arm ..... Division .....
Where born ..... Years in U. S. .....
Previous occupation ..... Weekly wages .....
Education: Grade ..... H. S. ..... College .....
Where educated ..... Years in school .....
Language ability .....
Disease history, personal and family .....

Total score ..... Percentile rank ..... Rating .....
Remarks .....

Examiners report .....

Examiner ..... Date .....

1. Ship Test (5 min.)

	Time: Credit only if accuracy = 18, 19 or 20							Cr. for Accuracy	Score	Wtd. Sc.
	0–20	21–30	31–50	51–80	81–120	121–300	T.L.			
Credit	5	4	3	2	1	0	0			

2. Manikin and Feature Profile

(a) Manikin (5 min.)	Time: Credit only if accuracy = 4 or 5							Cr. for Accuracy	Score	Wtd. Sc.
	0–10	11–15	16–20	21–30	31–50	51–120	T.L.			
Credit	5	4	3	2	1	0	0			
(b) Feature profile (5 Min.)	Time: Credit only if accuracy = 5									
	0–30	31–40	41–60	61–80	81–120	120–300	T.L.			
Credit	5	4	3	2	1	0	0			

3. Cube Imitation

	Response	+ or −	Score	Wtd. Sc.
(a)	1-2-3-4			
(b)	1-2-3-4-3			
(c)	2-3-4-1			
(d)	1-2-3-4			
(e)	1-2-1-2-4			
(f)	1-4-3-2-4			
(g)	1-2-3-4-1-3			
(h)	1-4-3-2-4-1			
(i)	1-4-3-1-2-4			
(j)	2-3-1-2-4-2			

4. Cube Construction (2 min. each. Unassembled blocks 6 moves, misplaced blocks 3 moves)

	Time: Credit only if blocks all assembled						Moves: Credit						Score	Wtd. Sc.
(a)	1–10	11–25	26–50	51–80	81–120	T.L.	9	10–11	12–15	16–25	26–50	over 50		
(b)	1–20	21–30	31–50	51–80	81–120	T.L.	9	10–11	12–15	16–25	26–50	over 50		
(c)	1–20	21–30	31–50	51–80	81–120	T.L.	8	9–10	11–15	16–25	26–50	over 50		
Credit	5	4	3	2	1	0	5	4	3	2	1	0		

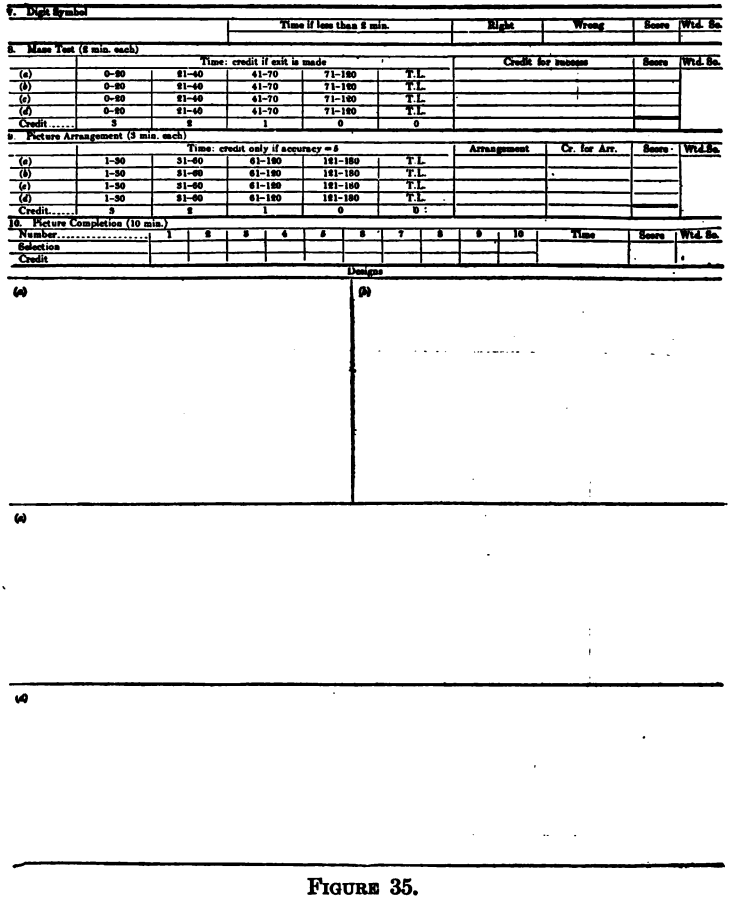
5. Form Board

	Time: Credit only if solved						Moves: Credit only if solved						Score	Wtd. Sc.
(a) (2 min.)	0–10	11–20	21–40	41–70	71–120	T.L.			3	4	5–7	over 7		
(b) (2 min.)	0–10	11–20	21–40	41–70	71–120	T.L.			5	6	7–10	over 10		
(c) (3 min.)	0–20	21–40	41–70	71–110	111–180	T.L.	8	9	10–11	12–14	15–20	over 20		
Credit	5	4	3	2	1	0	5	4	3	2	1	0		

6. Designs (2 min. each)

	a	b	c1	c2	d1	d2	Score	Wtd Sc.
Credit								

FIGURE 34.



7. Digit Symbol

	Time if less than 5 min.	Right	Wrong	Score	Wtd. Sc.

8. Maze Test (5 min. each)

	Time: credit if exit is made					Credit for success	Score	Wtd. Sc.
(a)	0–20	21–40	41–70	71–100	T.L.			
(b)	0–20	21–40	41–70	71–100	T.L.			
(c)	0–20	21–40	41–70	71–100	T.L.			
(d)	0–20	21–40	41–70	71–100	T.L.			
Credit	3	2	1	0	0			

9 Picture Arrangement (3 min. each)

	Time: credit only if accuracy = 5					Arrangement	Cr. for Arr.	Score	Wtd.Sc.
(a)	1–30	31–60	61–100	101–150	T.L.				
(b)	1–30	31–60	61–100	101–150	T.L.				
(c)	1–30	31–60	61–100	101–150	T.L.				
(d)	1–30	31–60	61–100	101–150	T.L.				
Credit	3	2	1	0	0				

10. Picture Completion (10 min.)

Number	1	2	3	4	5	6	7	8	9	10	Time	Score	Wtd. Sc.
Selection													
Credit													

Designs

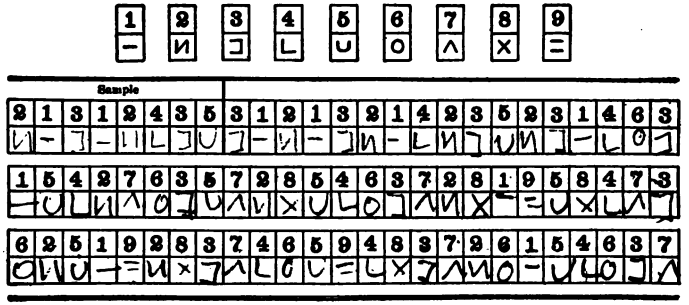
(a) (b)

(c)

(d)

FIGURE 35.

Digit-Symbol Test



Demonstration Maze

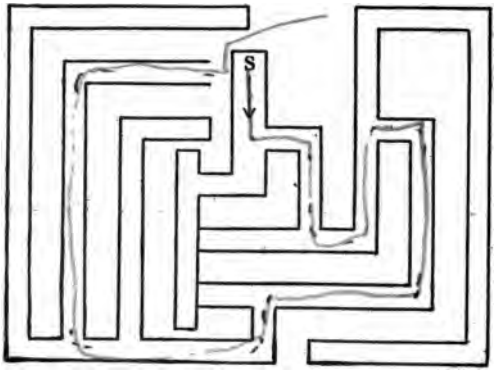


FIGURE 36.

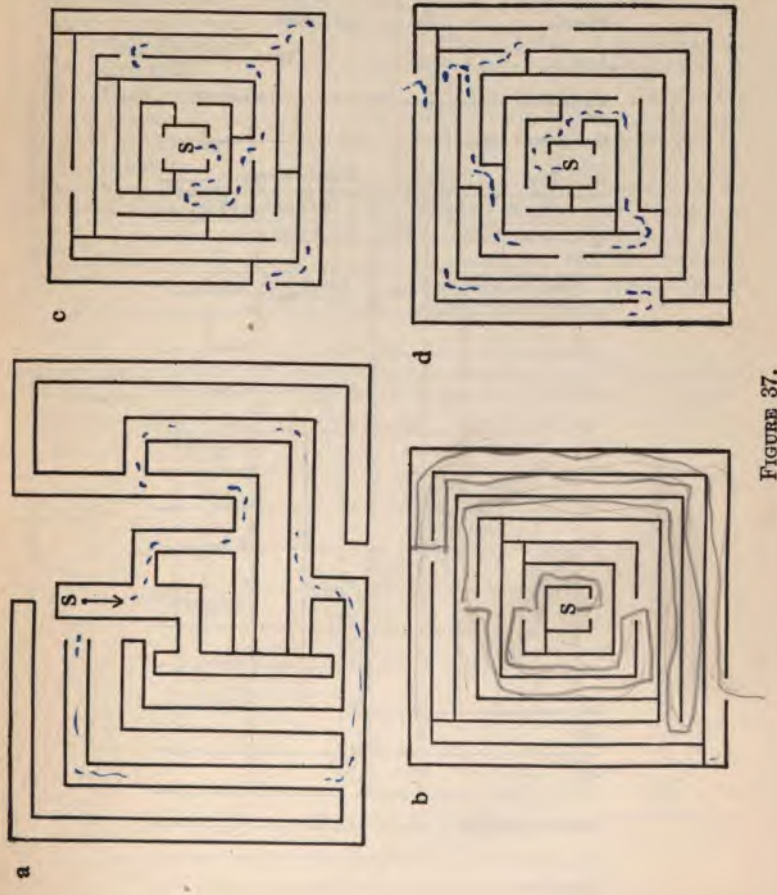


FIGURE 37.

PSYCHOLOGICAL RECORD

Name ..... **Age** .....

Rank ..... **Co.** ..... **Reg.** .....

Arm ..... **Div.** .....

Birthplace ..... **In U. S.** ..... **Race** .....

Occupation .....

Schooling ..... **Weekly Wages** .....

	GROUP EXAMINATION						INDIVIDUAL EXAM.				
Form	ALPHA		BETA		LIT.		PERFORMANCE				
	Raw Score	Wtd. Score	Raw Score	Wtd. Score	Score		Raw Score	Wtd. Score	POINT SCALE	
1						1			Points	
2						2			M. Age	
3						3			C. I.	
4						4			STANFORD SCALE	
5						5			Points	
6						6			M. Age	
7						7			I. Q.	
8						8			MECHANICAL TEST	
9						9			Points	
10						10			Per centile	
Total										
Rating										

Recommendation .....

.....

Disposition .....

Station .....

Examiner .....

Medical Department, U. S. A. 2—6107

FIGURE 38.

REPORT OF PSYCHOLOGICAL EXAMINATION

Grade	Explanation	Number	%
A	Very Superior		
B	Superior		
C+	High Average		
C	Average		
C—	Low Average		
D	Inferior		
D—	Very Inferior		

*.....E.....

.....191.....
Co.....Reg.....Div.....

The standing of your men in the psychological examination is as indicated below. An asterisk (*) following the rating of a man indicates that he is relatively illiterate in English because of foreign birth, lack of education, or inferior intelligence, The letter E indicates that the man has been recommended for Development Battalion, special service organization, or discharge.

Name	Grade	Name	Grade	Name	Grade

PSYCHOLOGICAL REPORT

Station.....

To the Surgeon General, U. S. Army. For week ending Saturday.....1918.
(To be mailed on or before following Tuesday)

.....

1. Organizations examined:.....

	White	Colored	Total	No. men given indiv. exam.	No. men given E in indiv. exam.
2. Number men examined: Enlisted	.....	.....	.....	White.....	.....
Officers	.....	.....	.....	Colored.....	.....

	Alpha only	Beta only	Beta after Alpha	Individual Pt. Sc.	St. B.	Perf.
3. Number of men examined by:	.....	....	.....	.....	.....	.....
4. No. E grades:	.....	....	.....	.....	.....	.....

5. Mental age Groups:	Below 6.	6–7.	7–8.	8–9.	9–10.	10–11.	11–12.	12 and above.
	.....	....	....	....	.....	.....	.....	.....

6. Number cases reported for:	Discharge	Development Battalion	Regular training	Special service or training
	.....	.....	.....	.....

7. Personnel reporting
IN: OUT: ILL.
Special detail:

8. Correspondence and reports.—Surgeon General's Office.

TO.	Date.	Subject.	FROM.	Date.	Subject.
1.			1.		
2.			2.		
3.			3.		
4.			4.		
5.			5.		
6.			6.		

9. Conferences and Special activities.

10. Supplies:

	Alpha 5	6	7	8	9	Beta 0	Psy. Rec.	Rep. Psy. E.	Pt. Sc.	St. B.	Perf.
On hand	..	..	..	..	..	....	.....				
Needed	..	..	..	..	..	....	.....				

Other equipment needed:

Examiner.....

INDEX

A

Alpha blank, form 5, tests 1–8, 206–219
form 6, tests 2–8, 220–233
form 7, tests 2–8, 234–247
form 8, tests 2–8, 248–261
form 9, tests 2–8, 262–275
examination, 16, directions for, 53–66
test 1, form 5, 54
test 1, form 6, 56
test 1, form 7, 58
test 1, form 8, 59
test 1, form 9, 61
test 2, 63
test 3, 63
test 4, 64
test 5, 64
test 6, 64
test 7, 65
test 8, 66
directions for scoring, 66
equivalent scores for, 133, 134
keys for, 70–77
procedure, 53
scores in educational institutions, 163
Analogies test, 65, 158
Apparatus, for beta examination, 79
Appendix A, Examiner's Guide, 133
B, Examiner's Guide, 135
C, Examiner's Guide, 137
Applications, educational, 188–193
of mental measurements, 184
Arithmetical problems, 63, 157
Army examining, directions for, 41
introduction of, 19
group examination "a," 7
groups, intelligence of, 27
tests, in S. A. T. C., 153
practical effects of, 197
requirements of, 2

Assignment, in army, 25
Atlanta Southern Dental College, results for, 167

B

Beta, blank, 276–283
examination, 16, 79
and army occupations, 199
apparatus for, 79
blackboard, 284
demonstration figures, 284
demonstration maze, 290
directions for, 79–88
directions for scoring, 88
equivalent scores for, 133–134
key, 276
procedure in, 80
test 1, 83, 277
test 2, 83, 278
test 3, 85, 279
test 4, 85, 280
test 5, 86, 281
test 6, 87, 282
test 7, 87, 283
test 8, insert
Bingham, Lieut.-Col. W. V., tests in colleges, 172–177
Blackboard, for beta, 79, 284
Brown University, results for, 167
Building, for psychological examining, 137–142

C

Case School, intelligence measurements in, 165
Children, mental classification of, 191–193
Classes, collegiate, results for, 172
Classification by intelligence, 22–24
mental, and educational treatment, 193
of children, 191–193
College of Wooster, intelligence measurements in, 165
Colleges, army tests in, 161, 177
Collegiate classes, results for, 172
Colorado College, results for, 168, 170
Committee, on army tests, 2
Companies, intelligence of, 34
Comparison of results for students, 164
Conferences, with officers, 49
Conscientious objectors, intelligence of, 196
Contents, Examiner's Guide, 42

Coöperation, value of, 203–204
Correlation, intelligence and industrial efficiency, 201–202
with military value, 30–33
of alpha with school data, 189
of beta with school data, 190
Correlations, 26
Crime and intelligence, 194–195
Criteria, for army tests, 2
Cube analysis test, 83
construction test, 105, 121
imitation test, 104, 121
Cubes, demonstration for beta, 79

D

Dartmouth College, intelligence measurements in, 165
Dearborn, form board, 107, 122
Demonstration figures, beta, 284
Demonstrator, in beta, 80–81
Departments of University, results for, 171
Designs, 110, 122
figures for, 143–152
Development battalion, and intelligence, 95
Digit-symbol test, 85, 112, 122, 290
Directions, for alpha examination, 53–66
for army examining, 41
for beta examination, 79–88
for individual examination, 92
for scoring alpha, 66
for scoring beta, 88
Disarranged sentences test, 64, 158
Dodge, Lieut.-Commander Raymond, on coöperation, 203–204
on mental engineering, 184–188

E

Education, of soldier, 194
Educational applications of mental tests, 188–193
institutions, intelligence measurements for, 163
Engineering, mental, 184–188
Equipment, for army examining, 135–136
for special building, 137–142
Equivalent scores and letter grades, 134
table of, 133, 134
Examination, conduct of, 52
for S. A. T. C., 155
individual, 92
purposes of, 43

Examiner's Guide, 41–152
contents, 42
outfit, 135
Examining, general procedure, 18
organization of, 45
Examining, plan of, in army, 43–44

F

Feature profile, 102, 121
First district Missouri Normal School, results for, 169
Form board, 107, 122

G

Geometrical construction test, 87
Group tests, early, 1
Gun-pointing, requirements of, 187

H

Hutchinson, Maj.-Gen., on personnel methods, 184

I

Illiteracy, in army, 194
Illiterates, individual examination, 92
Point Scale for, 96
segregation of, 51
Stanford-Binet examination for, 98
Individual examination, 15, 92
choice of, 93
examinations, summary of, 21
Information test, 66, 159
Intelligence, and crime, 194–195
and educational treatment, 192–193
and efficiency, 201
Intelligence and military offence, 194–195
rank, 38
service, 95
and occupation, 197–200
and prostitution, 196
by officers and arms of service, 37
differences in army groups, 29
grades, distribution of, 25–26
in university departments, 171
measurements, supplementation of, 50
values of, 28–40

of army groups, 27
of companies, 34
of conscientious objectors, 196
of regiments, 35
relation to military efficiency, 30
tests, criteria of value, 6
equivalent scores for, 133, 134
method of preparing, 2–5
origin of, 1
purposes of, 43
reliability of, 20

J

Johns Hopkins Univ. freshmen, results for, 167

K

Keys, for alpha tests, 70–77
for beta tests, 276

L

Letter-grades and mechanical skill test, 132
and performance examination scores, 128
and Point Scale scores, 98
and scores, 78
and Stanford-Binet age, 100
defined, 22–24
in beta, 91
significance of, 17
table of equivalent scores for, 134
Lincoln Memorial College, Tenn., results for, 167
Literates, individual examination, 92

M

Manikin and feature profile tests, 102, 121
Massachusetts Agricultural College, results for, 167
Maze test, 83, 113, 122
demonstration, 290
Mazes, beta, 291
Mechanical skill test, 128
abbreviated, 132
norms, 132
Men, results for, 167–170

Mental age and military service, 95
and performance examination, 127
Point Scale, 97
Stanford-Binet, 100
Military value, relation of intelligence to, 30
Millersville, Pa., normal school, results for, 169

N

Negro intelligence, 30
Non-English-speaking subjects, performance examination for, 120
Normal schools, results for, 169, 170
Norms, for mechanical skill test, 132
Notre Dame, results for, 167
Number checking test, 86
series completion test, 64, 158

O

Occupations and beta test, 199
and intelligence, 197–200
Officers, conferences with, 49
intelligence by arms of service, 37
opinions quoted, 10–15
ratings of, 31
Officers' Training Schools, intelligence in, 28
intelligence status, 36
Oral directions, test, 53, 157
Organization of psychological service, 45
Otis, A. S., group test, 2

P

Performance examination, 18
abbreviated, 126
and mental age, 127
blank, 288–291
directions for record, 123
equivalent scores for, 133, 134
procedure, 100
Personnel, bureau, 179–183
classification of, 178
officer, report to, 45
Peru, Nebraska, normal school, results for, 169
Picture arrangement test, 115, 123
completion test, 118, 123
Pictorial completion, 87
Placement, industrial, 200

Plan of examining, 43–44
Point Scale, 17
blank, 285–287
equivalent scores for, 133–134
examination, procedure, 96
score and mental age, 97
Practical judgment test, 63, 157
Preliminary trial of tests, 5
Procedure, in alpha, 53
in beta, 80
in performance, 100
in Point Scale, 96
in Stanford-Binet, 98
Profile, psychological, 174–175
Prostitution, and intelligence, 196
Psychiatrist, report to, 45–46
coöperation with, 46
Psychology, importance of, in army, 203–204
Psychological examination, report of, 293
record card, individual, 292
report, weekly, 294
Purposes, of examining, 43

R

Rank, military, and intelligence, 38
Recommendations, from examinations, 94
Record blanks, alpha, 206–275
army, 205–291
beta, 276–283
performance examination, directions for, 123
card, for individual, 292
Regiments, intelligence of, 26, 35
Reliability, of army tests, 20
Report form, for camps, 294
of examinations, 21–22, 293
Reserve officers' Training Corps, results for, 166
Results of army examining summarized, 12
of tests in colleges, 166–177
utilization of, 47
Revisions, of tests, 15
Rutgers College, results for, 167

S

Sam Houston, Texas, normal school, results for, 169
School, mental classification in, 191
Scientific basis for personnel activities, 186

Score, and mental age for performance examination, 127
in mechanical skill test, 129–131
in performance examination, 124–125
performance examination and letter-grades, 128
Point Scale, 97
raw, 78
total, for alpha, 78
total, for beta, 91
Scores, significance of, 17
table of equivalents, 133
Scoring, directions for S. A. T. C. examination, 159
alpha, method of, 78
directions for, 66
beta, 88
Scoring, beta, method of, 91
directions for S. A. T. C. examination, 159
Segregation, of illiterates, 51
Sex, and intelligence, 170
Ship test, 100, 120
Skill, mechanical, test, of, 128
Social significance, of army results, 193
Southern Methodist University, results for, 167, 168, 170
Specifications, industrial, 200
Standards, occupational, 198
Stanford-Binet, examination, 17
equivalent scores for, 133–134
procedure, 98
Statistical analysis of results, 5
State Teachers College, Col., results for, 168
Stenquist's mechanical skill test, 128
Students' Army Training Corps, examination, 153–160
intelligence measurements in, 165
Surveys of schools, 189
Symbol-digit test, in beta, 290
Synonym-antonym test, 64, 157

T

Temperament, measurement of, 200
Terman, Maj. L. M., and S. A. T. C. examination, 153
Training schools, intelligence status, 36

U

University, of California, results for, 165
of Florida, results for, 167
of Idaho, results for, 167, 168, 170

University, of Illinois, results for, 171–172
of Minnesota, freshmen, results for, 167, 168, 170
of North Dakota, results for, 168
of Texas, results for, 165
Uses of army tests, 47–48

V

Value of tests, officers' opinions of, 13
Virginia Polytechnic Institute, results for, 166
Vocational direction, basis for, 200

W

Weighting, performance examination score, 124–125
Women, results for, 168, 169, 170

X

X–O series test, 85

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